

Centre for Development, Environment and Policy



RETHINKING AGRICULTURAL INPUT SUBSIDY PROGRAMMES IN A CHANGING WORLD

Paper prepared for the Trade and Markets Division,
Food and Agriculture Organization of the United Nations

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April 2009

Summary

Recent years have seen a resurgent interest in large scale input subsidies, and particularly fertilizer subsidies, in agricultural development and food security policies in Africa. Very high global grain prices in the first part of 2008 appeared to make such subsidies even more attractive, but this was complicated by even more dramatic rises in fertilizer prices. Global grain and fertiliser prices have subsequently fallen back, but high grain prices persist in many domestic markets, and future prices are very uncertain.

This paper considers the roles of input subsidy programmes in poor rural economies in Africa in these difficult times. It begins with a brief review of historical changes in experience with and views of input subsidies, and of the factors behind resurgent interest in input subsidy programmes, particularly with a new generation of so called 'smart subsidies'. It then describes how particular features of smart subsidies demand a rethinking of some aspects of economic analysis of the benefits of subsidies implemented in different ways and contexts. This provides the foundation for a conceptual framework for considering the key issues affecting the performance of subsidy programmes in discussion of recent experience of specific input subsidy programmes.

The final part of the paper considers how current grain and fertiliser prices, and uncertainty regarding future prices, impacts on subsidy programmes, and asks what roles

input subsidy programmes may have under different price regimes in different contexts in the future, and what critical factors will determine their performance.

Countries considering the introduction of agricultural input subsidies should recognise the different potential benefits they can yield, the conditions required for those benefits to be realized, and the possible very significant pitfalls from ineffective implementation:

- input subsidies have played an important role in successful agricultural and broader development in the past, with major gains when effectively applied to overcome market failures constraining their productive use, but with substantial risks of costly and ineffective implementation using large amounts of scarce resources for little gain;
- they have greatest (but not exclusive) potential in contributing to wider growth when applied to production of staple grains with a key contribution to consumers' welfare and real incomes through lowering food prices, but this requires large programmes with complementary investment and output market development policies to bring prices down (perhaps below import parity) and involves substantial costs and risks;
- policy objectives of input subsidies are, like policy objectives in wider agricultural development, paradoxical – with investments in staple crop production and agriculture needed to stimulate diversification out of staple food and agricultural production;
- rationing and targeting are important features of effective subsidies – to limit costs and ensure that subsidies are largely delivered to producers whose effective input use is constrained by market failures – and smart subsidies' use for rationing and targeting can substantially address conventional criticisms of subsidies;
- smart subsidies are nevertheless still subject to major political economy and implementation challenges and need further new thinking and theory, with ongoing action research seeking to constantly improve effectiveness and efficiency and to keep ahead of fraud and rent seeking.
- agricultural input subsidies are not a short term 'quick fix' –medium to long term investments in input subsidies are needed if they are to build up farmer knowledge and capital, supply systems and wider economic growth. However the risks of their diversion, capture and inefficiency also grow over time, and this poses major political and technical challenges.

There is currently limited implementation of important aspects of smart subsidies in subsidy programmes in Africa, and weaknesses in design and implementation. There is also a lack of emphasis on improving programme effectiveness and efficiency, and inadequate attention to integration with complementary policies and programmes needed to for achievement of both direct and indirect benefits of input subsidy programmes. There is also a mixed record as regards use of input subsidies to develop input supply systems. Some of these aspects of input subsidy programmes are associated with divergence between political economy and more technocratic interests.

Lack of information on subsidy programmes in Africa highlights a major need for country studies that report different countries' recent experience with input subsidies, using the conceptual framework presented in this paper to allow a more comprehensive review and lesson learning than is currently possible.

Consideration of the considerable challenges and threats posed by global market and climate change and volatility emphasises the importance and urgency of (a) improving the efficiency and effectiveness of input subsidy programmes in contributing to increased agricultural productivity, food security, and wider non agricultural development and structural change, and (b) of looking for ways to reduce fertiliser use (through greater field efficiency in their application and through use of complementary soil fertility management practices) and to reduce supply costs.

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RETHINKING AGRICULTURAL INPUT SUBSIDY PROGRAMMES IN A CHANGING WORLD¹

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April 2009

1. Introduction

Recent years have seen a resurgent interest in large scale input subsidies, and particularly fertilizer subsidies, in agricultural development and food security policies in Africa. Very high global grain prices in the first part of 2008 appeared to make such subsidies even more attractive, but this was complicated by even more dramatic rises in fertilizer prices. While global grain and fertiliser prices have subsequently fallen back, high grain prices have persisted in many domestic markets, and future food and fertiliser prices are very uncertain.

This paper considers the roles of input subsidy programmes in poor rural economies in Africa in these difficult times. The paper begins with a brief review of historical changes in experience with and views of input subsidies, and of the factors behind resurgent interest in input subsidy programmes, particularly with a new generation of so called 'smart subsidies'. We then consider how the features of smart subsidies may demand a rethinking of economic analysis of the benefits of subsidies in different contexts. This provides the foundation for a conceptual framework for considering the key issues affecting the performance of subsidy programmes. This framework is then applied to discussion of recent experience of specific input subsidy programmes.

The final part of the paper considers how current grain and fertiliser prices, and uncertainty regarding future prices, impacts on subsidy programmes, and asks what roles input subsidy programmes may have under different price regimes in different contexts in the future, and what critical factors will determine their performance.

2. 'Conventional' input subsidies in agricultural development - theory and practice

Large scale (so called universal) agricultural input subsidies were a common and major feature of agricultural development policies in poor rural economies from the 1960s to the 1980s. They were generally implemented as 'across the board' price subsidies accessible to all producers, or to all producers of a particular category. If they were sold through a state monopsony then there were commonly attempts at price discrimination, with, for example, only smallholder farmers allowed to purchase subsidised fertiliser and forbidden from selling it on². Fertiliser subsidies were particularly expensive and made heavy and growing demands on government budgets as they stimulated increased fertiliser consumption (and hence increased volumes of fertiliser subsidy) while political pressures also led to pressures for the subsidy rate to increase, or at least not contract, in the face of growing fertiliser prices. For discussion of fertiliser subsidies in Asia see Fan et al 2007, Timmer 2004, Morris et al, 2007; Ellis 1992.

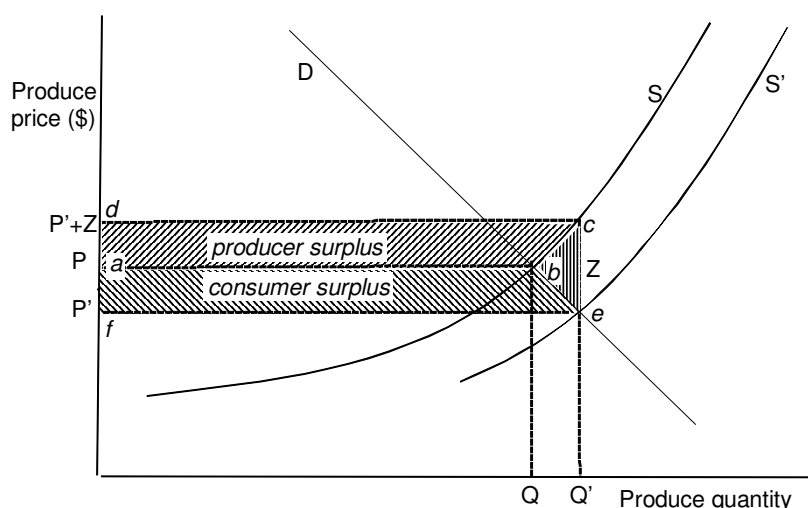
¹ This report has been commissioned by the Food and Agricultural Organisation of the United Nations. It draws heavily on work with Colin Poulton, Jonathan Kydd and Peter Hazell on agricultural development, and on work with Ephraim Chirwa, Thom Jayne, Duncan Boughton, Valerie Kelly, Eric Crawford and Rachel Slater on input subsidies. Parts of the text are drawn from Dorward, Poulton and Hazell (2008) and from Poulton and Dorward (2008). Frank Ellis, 'BB' Banful and Jamie Morrison provided helpful comments on an earlier draft. Any errors or omissions remain my responsibility. The views put forward in this paper are those of the author and are not attributable to any of these individuals or to FAO or any other organisation.

² We will discuss 'leakage' from subsidy sales later.

Conventional arguments for subsidies in agricultural development have focussed on the promotion of increased agricultural productivity through the adoption of new technologies (Ellis, 1992). Reduced costs of subsidised inputs increase their profitability and reduce risks perceived by farmers in adopting them in circumstances where farmers' limited knowledge first of input benefits and second of their correct usage inappropriately constrain their expenditure on input use. Together with credit and extension services, input subsidies were supposed to help farmers implement, benefit from and then, with the withdrawal of the subsidy, themselves fully fund economically and technically efficient input purchases and use: rapid learning with subsidies about input use and its benefits should mean that subsidies would be needed for only a short time and could be rapidly phased out. However subsidies were often subsequently implemented more widely with pan territorial pricing to support agricultural development in more remote areas, and to counteract taxes on agriculture through export tariffs, managed exchange rates and controls on domestic prices.

Economic analysis of price subsidies considers the costs and benefits of subsidies in shifting farmers' supply curves for agricultural produce (see figure 2.1). If there are no market failures then a subsidy of \$Z per unit output increases effective producer price above the market price by \$Z³, causing a downward shift in the market price supply curve (S to S' in figure 2.1) and this leads to an expansion in supply (from Q to Q') and a fall in market or consumer price of the product (from P to P' in figure 2.1, assuming that the good is a non-tradable with a downward sloping demand curve), with an increase in both producer surplus (shown in figure 2.1 by the shaded area *abcd*) and consumer surplus (shown by the shaded area *abef*)⁴. The total cost of the subsidy is the total subsidy paid (new equilibrium quantity multiplied by the per unit subsidy, Q'.Z, shown by the shaded area *dcef*) plus administration costs. The total subsidy paid is greater than the sum of the increased consumer and producer welfare by a deadweight loss shown in figure 2.1 by the triangle *bce* (Siamwalla and Valdes, 1986). Under such circumstances, and even without allowing for administration costs, the subsidy would therefore lead to a net economic loss to the country and an income transfer from taxpayers to consumers and producers.

Figure 2.1 Input subsidy impacts on output supply, price and stakeholder welfare



³ If the subsidy is addressing a market failure then a subsidy of \$Z per unit output will increase effective producer price above the market price by more than \$Z (say \$Z')

⁴ The net gain in producer surplus can also be represented as the total increase in producer surplus represented by the area between the supply curves S and S' below price P' less the loss in producer surplus as the result of the price fall from P to P', represented by the area between P and P' and to the left of curve S.

Three related points emerge from this analysis.

First, a subsidy can only generate a positive net economic return to a country if there is some market failure which means that the downward shift in the supply curve is greater than the cost of subsidising production, including the costs of subsidy administration (that is Z , the per unit cost of the subsidy to the government, is less than Z' , the effective increase in output price – or reduction in per unit costs - received by producers). This may occur where farmers' perceived private cost of inputs is higher than the true social or economic cost, and/or the farmers' perceptions of private benefits from increased input use are lower than the actual social or economic benefits⁵. Such situations can arise where (a) farmers' private costs of working capital for input purchase are greater than the social cost of capital, (b) farmers' lack of knowledge about the benefits of inputs means that their expectation of the production benefits from input use are less than the benefits that they will gain, (c) there are learning costs with input use such that initial farmer returns are low but these will increase with experience (see for example Ellis, 1992; Crawford et al, 2006; Morris et al, 2007)⁶, and (d) farmers' risk assessment and aversion in investing working capital in input purchase and use is higher than society's risk assessment and aversion. These divergences between farmers' and society's perceptions should decline as farmers gain experience with input use, with increasing knowledge of the benefits and risks of input use, increasing knowledge of how to use inputs, and consequent increasing efficiency in their use.

Second, the size of the deadweight loss and the distribution of benefits between consumers and producers depend upon the elasticities of supply and demand as shown in table 2.1 (see appendix 1 for diagrams). This is important as (a) larger deadweight losses are associated with increasing inefficiencies, and (b) the distribution of income transfers between producers and consumers has equity and poverty reduction impacts depending upon the relative wealth and incomes of the producers and consumers concerned.

Table 2.1 Effects of demand and supply inelasticities on consumer and producer gains and on deadweights

	Perfectly elastic demand	Unitary demand	Perfectly inelastic demand
Perfectly elastic supply, shifts down	N/A	All gains to consumers, Large deadweight	All gains to consumers, No deadweight
Unitary supply, shifts down / to the right	All gains to suppliers Large deadweight	Shared gains, some deadweight	All gains to consumers, No deadweight
Perfectly inelastic supply (may shift to the right)	All gains to suppliers. No deadweight	Gains shared (depending on supply shift), No deadweight	N/A

Elastic demand or supply tends to be associated with larger deadweight losses, and demand or supply inelasticity tends to be associated with smaller deadweight losses. Similarly inelastic demand is associated with larger shares of consumer surplus benefits, while inelastic supply (both price elasticity and with regard to the subsidy) is associated

⁵ This can be shown using marginal value product and marginal factor cost analysis, see figure 3.3.1.

⁶ This is effectively an infant industry argument.

with larger shares of producer surplus benefits. Staple food markets in land locked countries (with large import/export parity price differentials) tend to be associated with more inelastic demand by poor consumers (where prices lie between export and import parity prices). Demand tends to be more elastic for cash crops, and particularly export cash crops. It should also be noted that an implicit feature of this analysis is that it applies only to subsidies implemented on a large enough scale to affect output prices - small scale subsidies that do not significantly affect production and product prices are analytically equivalent to subsidies with highly elastic product demand: subsidy benefits are largely captured by suppliers / producers, and deadweight costs depend upon the elasticity of supply

Third, transfers to producers can be analysed in terms of inefficiencies associated with *economic rents*. Rents arise in three ways. First, if a general input subsidy is intended to deliver an economic gain by stimulating increased input use to increase production, part of the cost of the subsidy goes to reducing the cost of production for produce that would be produced anyway (this is the producer surplus on produce that would be produced anyway without the subsidy). Unless there is some social or economic benefit from transferring income to producers already using fertiliser, then the subsidy is an inefficient way of stimulating increased production and increased productivity, since the producer surplus to accruing to existing fertiliser use is not delivering any economic gain. Second, producer transfers often end up affecting the demand for agricultural land and labour, and bid up the demand for inputs, and hence apparent producer transfers may in fact be passed back to the suppliers of these factors of production as pure economic rents⁷. Third, where subsidised inputs are rationed (as is common), then such rationing leads to opportunities for those controlling subsidised inputs (politicians, government officials, fertiliser suppliers, farmer organisation office bearers, etc), to divert subsidised inputs from their intended beneficiaries for a side payment or to demand payments from beneficiaries in return for provision of subsidised inputs. The important point here is that even if there are net gains from a subsidy (as a result of divergences between farmers' and societies perceptions of costs and benefits from input use), much of the subsidy cost may be a straight transfer from the state (and hence from taxpayers) to producers and suppliers of land, labour and inputs without any economic gain (with the relative shares of transfers depending upon the elasticities of supply and demand).

Another major concern with input subsidies concerns the extent of leakages and diversion of subsidised inputs away from their intended use. In the context of the supply and demand analysis above, this can be considered in three ways – (a) diversion between products, (b) diversion from intended beneficiaries to others within the country, and (c) cross border leakage.

- a) Farmers are likely to apply inputs to the use from which they expect to get the greatest return. Fertilisers, for example, may be applied to a variety of crops. As we have seen, deadweight losses are reduced and benefits to poor consumers increased where subsidised inputs are used to expand production of products consumed by poor people with inelastic demand (these tend to be food staples). If returns to fertilisers are higher on other crops (for example cash crops) then farmers may apply subsidised fertilisers to cash crops which have much more price elastic demand and which are not consumed by the poor. Even if farmers do initially apply subsidised input to staple foods, with inelastic demand, a large scale subsidy will tend to reduce prices farmers receive for this crop, and this may in turn lead to fertiliser profitability and use switching to more demand elastic tradables – with increases in deadweights losses and reduced benefits for consumers. Switching of inputs between crops or products is not so directly possible for subsidised seeds⁸.

⁷ This is of course not a problem where the providers of land and labour benefiting from this are poor, indeed it can be an important way in which subsidies can promote pro-poor growth.

⁸ Although some indirect switching may happen due to wider capital fungibility

- b) Input subsidies in developing countries have commonly been targeted towards smallholder rather than commercial farmers, with mechanisms directing subsidised inputs away from large scale commercial farms and regulations prohibiting sale of subsidised inputs by recipients. Where a general subsidy is applied it is difficult to channel subsidised inputs to smallholders unless there are a limited number of tightly controlled supply chains, clear ways of identifying intended beneficiaries, and a high degree of discipline and control of private fertiliser transactions. If subsidised inputs are used by larger scale commercial farms this is likely to lead to increased diversion away from staple food crop production to cash crops (as discussed above) and a greater share of transfers to less poor producers. Similar issues arise in subsidy access between richer and poorer smallholders.
- c) Cross border leakages arise when subsidised inputs are sold outside the country at a discount. The value of the discount represents a straight loss from the transfer of resources outside the country, with the loss of any chance of consumer benefits or economic gain from increased input use.

The final point to note from analysis of input subsidies' effects on product supply and demand is that the extent of supply shifts is critical in determining deadweight losses, the distribution of transfers between producers and consumers, and the extent of wider economic gains. The supply shift is itself determined by the technical efficiency of input use – determined by the quality and appropriateness of the inputs to the product they are used on, the timing of their delivery to farmers, the availability of complementary resources (for example seed and fertiliser together), and the technical skill or competence in the use of the inputs (in comparison with the without subsidy situation).

The analysis above of product supply and demand impacts of input subsidies shows many of the things that can go wrong to undermine the economic benefits of input subsidies: the very large transfers to producers and consumers (reducing the efficiency of subsidies in achieving economic gains, and leading to dominance of political economy rather than economic considerations in subsidy policy, with tendencies for these transfers to be captured by elites and/or used for political ends⁹); the presence of deadweight costs (in addition to administration costs, which have not been explicitly considered thus far in the discussion); the dangers of diversion and leakage; and difficulties in clearly specifying economic gains, with the tendency for these to diminish over time. More positively, however, the analysis also helps in the identification of features of subsidies that are likely to yield more benefits and to face lesser dangers of things going wrong. This in turn provides insights about where subsidies are most likely to be useful, and about the ways that subsidies should be implemented. It suggests that inputs subsidies should be focussed

- on those producers who are not using inputs because of market failure,
- on the use of inputs on products where they can induce a substantial supply shift (and this may also require, for example, complementary input supply, extension and output markets infrastructure and services), and
- on stimulating products with inelastic demand and supply (particularly inelastic demand) among poor producers and consumers: staple grain production tends to have these characteristics in poor large or land locked countries with suitable agro-ecological conditions.

It is noteworthy that although input subsidies are directed at producers and at changing production methods and producer behaviour, this analysis emphasises the importance of consumer in addition to (or rather than) producer benefits for maximising both economic and welfare gains from subsidies. Input subsidies should also be implemented in ways that (a) reduce deadweight losses and rents from straight transfers, (b) reduce leakages,

⁹ This is a point made strongly by Bates (1981)

and (c) have low administration costs. The analysis also suggests that subsidies may be less efficient instruments if they are primarily aimed at delivering income transfers to producers and remote areas, because of high deadweight and administration costs, generation of rents, and difficulties in developing / delivering complementary services needed for technically and economically efficient use of subsidised inputs. The distributional impacts and multipliers from expenditure on input subsidies therefore also need to be considered against alternative (tax and subsidy or transfer) instruments for changing income distribution and for stimulating growth.

The conclusions from the theoretical analysis above matches (and influenced) the conventional wisdom among most economists and northern policy analysts on difficulties with input subsidy programmes. This also emphasised difficulties with

- controlling costs, both with general subsidies through, for example, fertiliser production or import subsidies and with quotas or targeted subsidies where there tend to be strong political pressures for the expansion of subsidies, and only weak pressures for their control.
- 'exits': there is strong political resistance to scaling down or termination of subsidies.
- effectiveness of targeting of input subsidies to particular farmer types, with problems of diversion and leakage noted above both expanding programme cost and reducing efficiency.
- over use of inputs, or adoption of input intensive rather than more economically efficient labour intensive production methods, as a result of artificially low input prices
- regressive benefits favouring larger farmers who can afford subsidised inputs (the poorest farmers may not be able to afford inputs even where they are subsidised).
- market distortions, and particularly parastatal involvement in subsidised input delivery, tending to crowd out and inhibit private sector investment in input supply systems and provide opportunities for corruption, and hence impede sustainable development.

Although agricultural input subsidies have continued to a greater and lesser extent in a number of countries, conventional wisdom and dominant donor thinking in the 80s and 90s was that such subsidies had been ineffective and inefficient policy instruments in Africa and that they had contributed to government over-spending and fiscal and macro-economic problems.

From the mid 1990s, however, this conventional wisdom has increasingly been challenged with a resurgence of interest in agricultural input subsidies in Africa, new thinking about the historical and potential roles in agricultural development, and the complementary emergence of innovative subsidy delivery systems and instruments.

3. Rethinking input subsidies

New thinking on input (and particularly fertiliser) subsidies in Africa has arisen for a number of related reasons. The fundamental driver of this has been increased questioning by African politicians, by NGOs and by some policy analysts about the failures of liberalised policies in supporting broad based agricultural development, particularly sustainable intensification of staple food crop production. This has been accompanied by strong political demands for fertiliser subsidies in many countries; tensions among donors in resisting such demands (with increasing legitimacy of democratic governments in Africa and divergent donor views on subsidy merits); concerns about declining soil fertility, agricultural stagnation and rural poverty in Africa; and identification of input subsidies as a potential instrument for social protection policies. The Abuja conference marked a significant milestone in this.

These concerns have led to interest in the potential for input subsidies to deliver a wider range of (sometimes unstated) objectives than those formerly recognised in the conventional wisdom described earlier. These objectives include, in addition to those considered earlier¹⁰:

- Short term private input market development
- Replenishment of soil fertility
- Social protection for poor subsidy recipients
- National and household food security
- Meeting broad based political demands

There has also been considerable interest in the development of new instruments and approaches in designing and delivering input subsidies, as so called 'smart subsidies'. Morris et al. (2007) describe 10 features of smart subsidies: 'promoting fertiliser as part of a wider strategy', 'favouring market based solutions' in input supply, 'promoting competition' in input supply, 'paying attention to demand', 'insisting on economic efficiency', 'empowering farmers', 'involving an exit strategy', 'pursuing regional integration', 'ensuring sustainability', and 'promoting pro-poor economic growth' (op.cit, p103-104). They recognise that 'in exceptional circumstances, poverty reduction or food security objectives may even be given precedence over efficiency and sustainability goals' (op.cit, p104-105). Instruments proposed for implementing smart subsidies include demonstration packs, vouchers, matching grants and loan guarantees. For all of these the details of instrument design and implementation are critical to their success. These instruments and design and implementation issues will be returned to later.

The interest in getting input subsidies to serve new functions and objectives, and the extent to which input subsidies are the most cost effective way of achieving these objectives continues to be controversial. The main text of the 2008 World Development Report on "Agriculture for Development", for example, recognises all the features of smart subsidies outlined above, but its summarised position is more restricted and conventional, focusing on subsidy roles as being to provide "sustainable solutions to market failures, ...through ... 'market smart' approaches to jumpstarting agricultural input markets...., and underwriting risks of early adoption of new technologies to help achieve economies of scale ... to reduce input prices ...as part of a comprehensive strategy to improve productivity with credible exit options" (World Bank, 2008).

It is, however, possible to question how important some of these objectives were in successful Asian Green Revolutions (for example replenishment of soil fertility, and social protection for poor subsidy recipients) and to identify other, perhaps more important, outcomes from subsidy use in these green revolutions or in more recent input subsidy programmes. Such outcomes include

- long term 'thickening' of supply chains and rural markets;
- lower staple food prices and higher wages;
- increased real incomes for poor non-recipients as a result of food price and wage changes; and
- longer term structural changes in livelihoods and the rural and national economy with expanded domestic demand for higher value livestock and horticultural products and for non farm goods and services together with expanded supply capacity, due to release of land and labour as a result of increased staple crop productivity.

¹⁰ Morris et al. (2007)

These debates, together with new insights into development processes, require a revisiting of the conventional wisdom on subsidies:

- a re-examination of the empirical and historical and empirical record of success and failure;
- an examination of the various development opportunities and constraints facing African farmers;
- a re-examination of theoretical understanding of contributions and implementation modalities of agricultural input subsidies in such situations; and
- a more holistic conceptual framework for examining the roles, instruments and implementation of input subsidies

The remainder of this section addresses each of these issues to provide a basis for a review of recent experience with input subsidies in Africa in the subsequent section.

3.1. Revisiting input subsidies' historical successes and failures

A detailed examination of the empirical record of subsidies' historical successes and failures is beyond the scope of this paper. However we briefly consider first the Asian green revolution experience with input subsidies and then African experience up to the early 1990s.

The Washington consensus and then the Post Washington consensus on agriculture recognised the substantial success of the green revolution in Asian countries in driving growth and poverty reduction but, implicitly or explicitly, considered this to have been achieved despite, rather than assisted by, input subsidies (and other subsidised services). This position was taken despite long standing work showing the importance of subsidies in Indonesia, for example, in promoting agricultural growth (Timmer, 2004) in precisely the types of situations where the analysis presented earlier suggests that such subsidies might have the greatest effect (food staples in large countries, with high physical returns from input use). Dorward et al (2004) in a review of green revolution experience in Asia argue that sustained (but not indefinite) input subsidies were a major part of successful Green Revolution packages, making a critical contribution to thickening and thus 'kick starting markets' first within staple food supply chains and then in the wider rural economy. Djurfeldt et al (2005) also argue that input subsidies were a critical element within green revolution policies, drawing on detailed policies reviews across a range of Asian countries. Fan et al (2007) provide empirical evidence on the contribution of input subsidies to growth and poverty reduction in India in the early stages of the green revolution but not later. This confirms an important point made by Dorward et al (2004), that later ineffectiveness and inefficiencies of input subsidies should not obscure their initial contribution in driving growth forward ¹¹.

Much of the Washington consensus pessimism regarding input subsidies was founded on later inefficiency of Asian subsidies and African experience of such subsidies. The Berg report criticised input subsidies as a major element in fiscally and economically unsustainable policies that were highly inefficient, ineffective and expensive in Africa. These policies distorted market incentives, blunted competitiveness and farmer incentives, and undermined the growth of private sector services. In this, subsidised input systems may have looked good for farmers (as regards services that were supposed to be provided), but the theoretical difficulties discussed earlier were compounded by diversion and inefficiency such that actual benefits to farmers were often very limited (World Bank, 1981). It should be noted, however, that there are countries that implemented input

¹¹ There are, ironically, parallels here with debates about the importance of agriculture itself as an initial driver of growth in poor rural economies: the later relative decline of agriculture in emerging economies should not obscure its earlier importance in getting broad based growth going.

subsidy systems that had initial success in raising productivity but for varying political and economic reasons failed to sustain the fiscal investment and market systems necessary for sustained benefits (for example Zimbabwe and Malawi).

Dorward et al (2009) compare experience of state led and private market led development approaches in fostering widespread and sustained growth in smallholder food staples. They note that while there are egregious examples of failure with state led approaches, there are also examples of dramatic success (as noted above). Private market led approaches, on the other hand, have very few examples of success¹², and many failures, but the failures of continued rural poverty are more hidden in rural areas and, to economists and policy analysts working with governments and businesses, consequent chronic humanitarian problems may be less obvious than macro-economic and fiscal crises.

3.2. Development opportunities and constraints facing African farmers

Successful investments in input subsidies in the Asian green revolution cannot, however, be simply transferred across to African countries – as experience in the 1970s and 1980s showed. It is important to identify the situations where input subsidies could work to take opportunities and overcome constraints facing African farmers.

Poulton and Dorward (2008) and Dorward, Chirwa and Poulton (2008) consider constraints and opportunities for growth for different agricultural products in different situations in Africa and southern Africa. These are summarised in table 1 overleaf (adapted from Poulton and Dorward, 2008, and from Dorward et al, 2008).

Drawing on insights from Byerlee et al. 2006 and Hazell et al. 2007, this table presents a typology that sets out first the major roles for increased productivity for different types of agricultural products in countries with different characteristics, and then the major challenges that need to be addressed to achieve increased productivity. Distinctions are made first between different types of crops and products (and implicitly between different agro-ecological zones associated with these). Maize, rice (notably NERICA) and possibly wheat (though this is a much less important crop in Africa) are cereals with potential high responses to significant investments in inorganic (and organic) fertiliser application. Millet and sorghum have generally lower yield potential, but there are still possibilities for significant yield responses in the context of integrated soil fertility management (ISFM) practices involving, for example, better water control, use of organic matter and micro-dosing with critical nutrients¹³. Root crops, particularly cassava, have the potential for significant yield increases with intensification but although with time this will require substantial increases in fertiliser inputs, there are initial opportunities for major yield increases from improved varieties. Non-staple products are considered in terms of non-tradables and tradables, the latter broken down between domestically consumed and exported tradables.

¹² It can also be argued that private market led approaches have never been properly tried – liberalisation of food markets has proved very difficult to consistently implement- and not just in Africa. This is, however, another challenge to private market led approaches. An exception to this has been the recent growth of smallholder fertiliser use in Kenya (Ariga et al, 2008) which, while aided by special conditions which prevent its wholesale application to other countries, nevertheless carries important lessons.

¹³ Morris et al. 2007 present data suggesting that maize and rice tend to have higher fertilizer responses than sorghum and millet, but that for all crops the responses are highly variable and sensitive to rainfall, soils, fertilizer application methods and formulations, and complementary soil and other management practices.

Table 3.2.1 Typology of Agricultural Products by Roles, Countries and Challenges and Opportunities

	Staple foods			Non staple products with productivity potential		
	High response cereals <i>Maize, rice ?, wheat?</i>	Low response cereals <i>Sorghum, millet</i>	Roots/ tubers <i>Cassava, (sweet potatoes)</i>	Domestically consumed non-tradables	Domestically consumed tradables	Traditional / non-traditional exports
Broad Role	Pro-poor growth	Least cost welfare, growth platform	Pro-poor growth	Support growth, with staple spillovers	Support growth, with staple spillovers	Drive growth with staple spillovers?
Countries with Minerals	Support & spread growth	Subsistence, support & spread growth	Support & spread growth	Support & spread growth	Support & spread growth	Minor driver & spreads growth
Coastal, No minerals	Regional driver & supports growth	Subsistence & support growth	Regional driver & supports growth	Support growth	Support growth	Regional driver & supports growth
Land locked No minerals	Major driver & then supporter	Subsistence	Major driver & then supporter	Support growth	Support growth	Driver
Challenges	Technology					
	Irrigation?	Yield package?	Processing?	various	various	various
	Public goods (research, infrastructure, institutional environment)					
	Policy coordination					
	Complementary service coordination					
	Global commodity & product prices (profitability, input affordability)					
	Price instability (intra & inter seasonal)					
	Price / productivity tightrope					
	Seasonal input finance					

The high potential yields achievable with the 'high response cereals' and 'roots and tubers' suggests that these have the potential to make a major contribution to driving and supporting pro-poor growth in countries where these crops can be produced, depending on other potential drivers of growth in these countries.

The lower but still improved yields achievable with 'low response cereals' in more challenging agro-ecological conditions suggest that these will not be able to drive growth but they should have important roles in supporting growth and in providing a lower cost and more developmentally beneficial subsistence safety net (as compared with humanitarian relief). Again the role will vary between countries with opportunities for minerals, manufacturing industries and cash crops to drive growth (although the more challenging agro-ecologies where these crops are grown are also likely to limit cash crop and livestock development options¹⁴).

The lower part of the table lists major challenges faced by the different products (assuming that they are being produced in broadly suitable agro-ecological areas). All products face technical challenges and opportunities to increase productivity and stability, though the nature and extent of these challenges and opportunities varies between products and contexts. There is also common under investments in public goods provision (technical research and extension, market and institutions) particularly for staples where prices and value chain profits are limited. All products are also affected by uncertainty and variability in global commodity prices as they affect input and output prices. However the location of the text and thickness of arrows in table 1 also show that there are considerable differences between different products in the challenges they face.

The key points here as regards consideration of roles of input subsidy programmes are that while high response cereals are (with roots and tubers) the products with the greatest importance and potential for driving and/or spreading growth they are also the crops which are most affected by challenges and failures in complementary service coordination, price instability, the price/productivity tightrope¹⁵, and seasonal input finance provision. These characteristics suggest that high response cereals fulfill many of the requirements identified in section 2.1 for well designed and implemented input subsidies to have a role to play in stimulating pro-poor growth:

- the complementary service coordination and seasonal finance challenges are market failures that inhibit input use, so that the gains from subsidies addressing input affordability problems have the potential to exceed deadweight and implementation costs;
- inelastic demand for food staples means that (a) deadweight losses should be relatively low and (b) many of the gains of producer subsidies should accrue to poor consumers - if subsidies increase production on a sufficiently large scale to lower prices – and in this way input subsidies can provide a means for addressing the food price/productivity tightrope.
- they can, in the right agro-ecological conditions and with proper management, lead to substantial productivity and production increase

This last point is important, in the context of arguments by Dorward et al (2004), in their review of successful and partly successful green revolutions, that state interventionist approaches (including input subsidies) will not be effective, or will be less effective, if they are implemented in situations where basic conditions necessary for development have not

¹⁴ In such situations investment in increased staple productivity may be a least cost way of providing safety nets in a way that encourages economic activity rather than dependency.

¹⁵ The price/productivity tightrope refers to the dilemma in poor agrarian countries where on the one hand high food prices are needed to stimulate investment in inputs but on the other hand such prices damage poor consumers who spend a large part of their income on staple foods, and thus undermine poor consumer welfare and wider pro-poor growth.

been established, with (a) technologies and management and soil, climate and pest conditions, that generate sufficient productivity gains and (b) complementary infrastructure and institutions to support extension services and market activities.¹⁶ This ties in with earlier arguments regarding potentially large deadweight costs from producer oriented subsidies in remote areas to suggest that input subsidies are likely to be more effective in areas with more favourable agro-ecological conditions for high response cereals and with good market access and higher population densities. This approach is articulated in recent thinking regarding prioritising investments in 'breadbasket areas' in Africa (AGRA, 2008). This is not to say, however, that input subsidies will never be warranted for cash crops or outside breadbasket areas – there may be market failures inhibiting input led productivity growth which warrant input subsidies – but the nature of such subsidies are likely to differ from those aimed at stimulating input led productivity growth in staple crops for the principle benefit of poor food buyers.

3.3. Rethinking input subsidies - theory and practice

Rethinking of the role of subsidies and the introduction of smart subsidies requires a revisiting of some of the conventional thinking about input subsidies as set out earlier in section 2. This is not to suggest that the earlier analysis or the insights it yields are faulty, but that it does not adequately reflect the ways that different subsidy systems can work and impact on producers and consumers. We extend the analysis of section 2 by considering a number of features of current subsidy programmes that are not explicitly or adequately considered in the theoretical considerations outlined earlier:

- the role of subsidies in reducing input profitability problems;
- the role of subsidies in reducing input affordability problems;
- targeting of input subsidies to specific household types;
- rationing of input subsidies;
- impacts of subsidies on input supply systems;
- dynamic effects of subsidies on pro-poor growth;
- subsistence production and net deficit producers;
- leakages and secondary markets;
- entitlement and distribution systems;
- complementary investments, policies and instruments
- soil fertility replenishment
- the political economy of input subsidies.

3.3.1. The role of subsidies in reducing input profitability problems

We can identify four ways in which the profitability of input use may be improved, by:

1. Raising physical productivity of inputs – through adaptation of technologies and farmers' learning how to manage them, and when (and when not) to use them
2. Reducing the costs of inputs by increasing efficiencies in (for example) fertiliser or seed production and/or delivery systems
3. Reducing farmers' input costs through input subsidies
4. Increasing output prices through market interventions (with either high consumer prices or with subsidies funded by tax payers)

Conventional thinking on input subsidies emphasises their role in improving the profitability of input use primarily through approaches 1 and 3 above in order to (a) address farmers' limited knowledge first of input benefits and second of their correct usage, (b) improve agricultural profitability in more remote areas, and (c) counteract taxes on agriculture through export tariffs, managed exchange rates and controls on domestic

¹⁶ Dorward et al (2004) also note the need for implementation that is both effective and sustained long enough to achieve systemic structural changes in productivity and markets.

prices. While *profitability constraints* on input use on food crops continue to be important, the nature of these constraints has changed, and (as will be discussed later) at the same time *affordability constraints* have become more important.

We discuss these two changes in turn. We note that different analysis may be needed for different inputs and consider first issues related to fertiliser subsidies before briefly mentioning differences with seed subsidies.

On the changing nature of *profitability constraints* with regard to fertilisers, we consider first constraints to farmer purchases as a result of lack of knowledge of fertiliser benefits and of their correct usage. After many years in which fertilisers have been promoted through subsidies, it is generally no longer the case that most farmers are unaware of fertilisers' benefits, indeed lack of access to fertiliser is commonly cited by farmers as a major constraint on their agricultural production. The extent to which farmers have direct experience of fertiliser use will vary, but past subsidy, demonstration and hand-out programmes together with fertiliser purchases by less poor farmers for cash crop production mean that in most areas there are farmers with direct experience of fertiliser use, and observation and reports of fertiliser use are widespread. Farmers' ability to use fertilisers effectively and efficiently (through proper selection of fertiliser types, appropriate timing and method of application, and use of complementary investments in, for example, soil and water management and crop varieties) is more variable, and input subsidy programmes continue to have a potential role in helping farmers to learn from experience here. This is likely to be particularly the case with poorer farmers who do not have access to fertilisers for cash crop production and who are also less able to access improved seeds and extension advice. However if fertiliser subsidy programmes are to help farmers improve their use of fertiliser then this requires subsidised provision of appropriate fertilisers and timely implementation supported by complementary investments in extension services and in promotion of improved soil and water management and crop varieties. Seed subsidies have an important and more conventional 'profitability' role in promoting both achievement and knowledge of higher returns from fertiliser use and of higher returns from their own use in conjunction with fertiliser.

The high costs of fertilisers (as a proportion of crop production costs) mean that (perceived and actual) profitability of their use is strongly influenced not only by (perceived and actual) physical returns or responses to fertiliser use (discussed above) but also by relative fertiliser and crop prices. Relative global prices of crops and fertilisers have fluctuated over the last 40 years but do not show any systemic changes¹⁷. Relative domestic prices, however, will have changed in different ways in different countries: liberalisation policies from the 1980s will have generally led to higher food and fertiliser prices (due to exchange rate devaluations) but changes in relative prices will have been affected by continuing interventions in food markets, by differences in produce and input domestic market linkages to world markets, and by differences in import tariff rates. It is therefore not possible to generalise as regards declining or increasing profitability of unsubsidised fertiliser use over the last 30 years. However variability in food prices is a major issue in many countries. Risks of low food prices leading to low profitability of fertiliser use may depress fertiliser use in less poor farmers' production of surplus food for the market. While fears of high food prices may make fertiliser use more profitable for poorer food deficit farmers, use of fertiliser by such farmers is more likely to be constrained by *affordability constraints* arising from problems in accessing seasonal finance, to which we now turn.

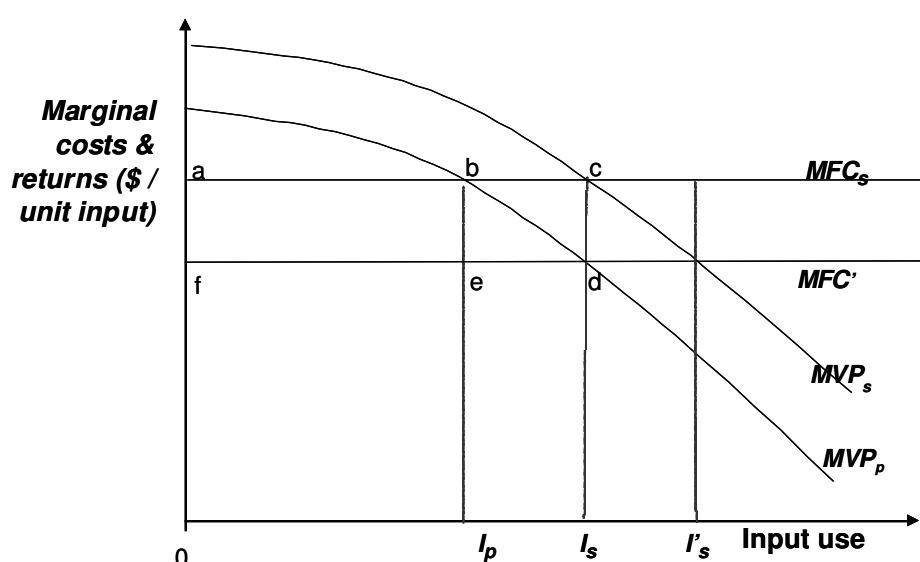
¹⁷ There are differences, however, for some specific fertilisers –phosphate prices, for example, increased much more than nitrogenous fertiliser prices in the recent price spike.

3.3.2. The role of subsidies in reducing input affordability problems

As noted in section 3.2 above, access to seasonal finance is widely considered to be a major constraint on input use on staple food crops, especially among poorer farmers. We describe this in terms of difficulties with the *affordability* of inputs. In theory farmers can finance input purchases from farm savings, from non-farm income sources or by borrowing (Poulton and Dorward, 2008). However (particularly poorer) small farm households are rarely able to save enough to fund significant intensification, and few have access to sufficient non-farm income sources for this purpose. Credit has therefore long been recognised as a priority to support input purchases and agricultural intensification (see for example Feder et al. 1985) and state provision of subsidised seasonal credit services were a significant part of the bundle of subsidised services, with input provision, in successful green revolutions (Dorward et al, 2004; Djurfeldt et al., 2005). Severe (and justifiable) criticism of agricultural credit programmes (for example Adams and Vogel 1986; Yaron 1992) as fiscally unsustainable (with a large subsidy component and major repayment problems), and regressive (with the majority of loans going to well-connected, wealthy borrowers and limited benefits to poor households) led to their demise. The abolition of these programme has not, however, led to their replacement by private sector and micro-finance services for staple food crop production, although there have been and continue to be successful models for delivery of seasonal finance to non-staple producers (where higher value crops give limited numbers of produce buyers incentives to invest in smallholder production).

The absence of complementary financial services allowing farmers to access credit to finance the significant costs of purchasing fertiliser means that only if subsidies lead to sufficiently large reductions in fertiliser prices will they lead to increased access to fertilisers by poorer farmers. If subsidies lead to smaller reductions in fertiliser prices which do not make them affordable by poorer farmers then they are likely to mainly benefit less poor farmers whose use of unsubsidized fertiliser is less constrained by lack of knowledge of how to use fertilisers or by inability to finance their purchase.

Figure 3.3.1 Conventional marginal analysis of input subsidy impacts



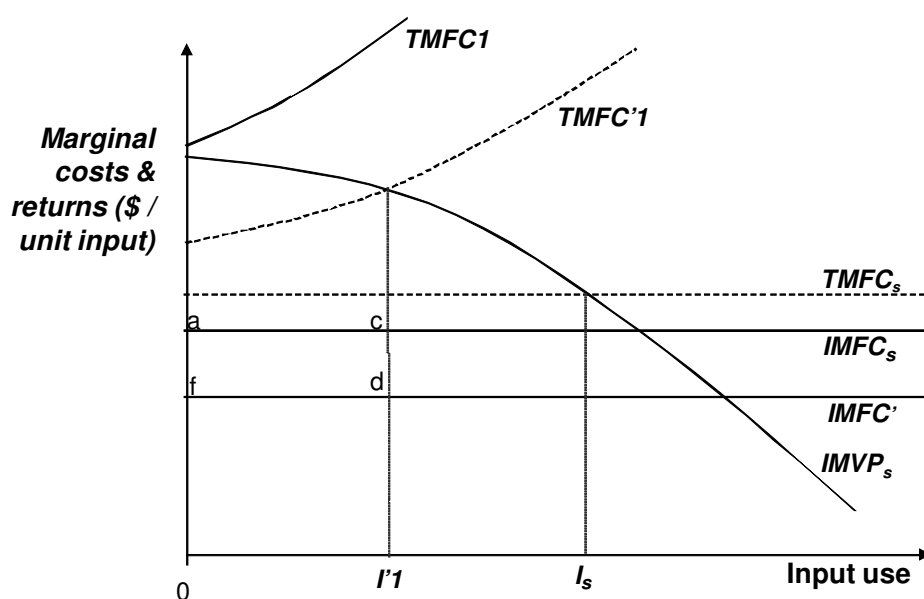
We examine this using analysis of input use comparing marginal value products and marginal factor costs. We begin by considering conventional analysis of the profitability

impacts of a subsidy as shown in figure 3.3.1. The basic Marginal Value Product and Marginal Factor Cost of input use in the economy are shown by MVP_s and MFC_s respectively. The economically optimum use of inputs will be at the point where $MVP_s = MFC_s$, with input use I_s . A subsidy may be warranted, however, if information failures (lack of knowledge about inputs and their use) cause farmers to perceive that they will achieve a lower Marginal Value Product from input use (MVP_p) causing them to apply input use up to the point I_p , a suboptimal use of inputs. A subsidy which lowers the price of inputs and hence the MFC from MFC_s to MFC' would result in farmers increasing their input use to the point where $MFC' = MVP_p$, which is the economically efficient rate of input use, I_s .

Inefficiencies in the subsidy can be seen in two ways. First, if there are some farmers who have a correct understanding of the benefits of input use, then these will apply inputs up to the rate I_x , where $MFC' = MVP_s$, and this will be an inefficient over-use of inputs. Second, the total cost of the subsidy per farmer (assuming that all farmers apply inputs at I_s) will be the total amount of input used multiplied by the subsidy per unit input, represented by the rectangle $acdf$. However of this only the expenditure represented by the triangle bcd is actually stimulating increased input use, the remainder (represented by the area $abdf$) represents a transfer to producers (assuming no output price changes, ie perfectly elastic demand)¹⁸.

We now extend this analysis by introducing affordability constraints in figure 3.3.2 with steeply rising credit interest and transaction costs above the marginal factor cost of input purchases.

Figure 3.3.2 Input subsidy marginal analysis for capital constrained households



The basic Marginal Value Product and Marginal Factor Cost of input use in the economy are shown in figure 3.3.2 by $IMVP_s$ and $IMFC_s$ respectively, but the total marginal factor cost of input use ($TMFC_s$) lies above $IMFC_s$ as a result of social costs of credit transactions and interest¹⁹. The economically optimum use of inputs will be at input use I_s .

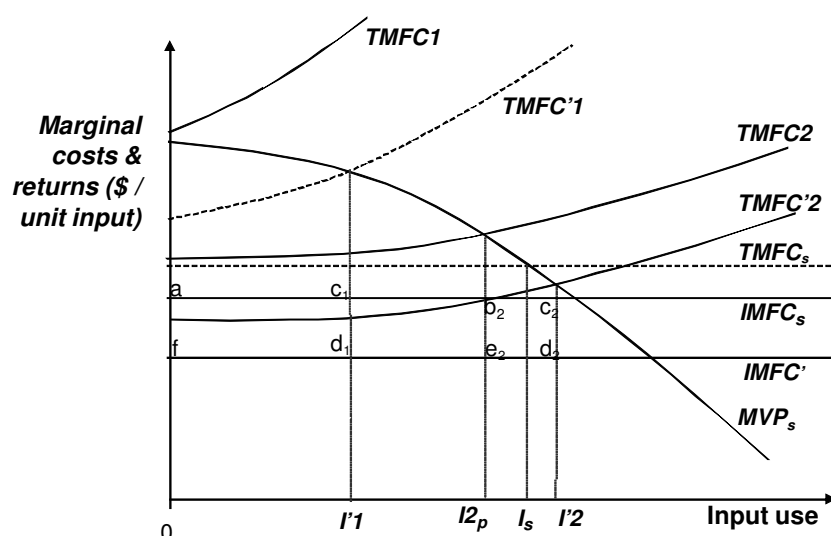
¹⁸ If demand is inelastic then output prices will fall with some of the subsidy cost providing benefits to consumers.

¹⁹ Marginal transaction and interest costs (the difference between $TMFC_s$ and $IMFC_s$) are shown as constant irrespective of amount of input applied. It could be argued that these would fall

where $MVP_s = TMFC_s$. Poor households, however, face very high interest and transaction costs when borrowing short term capital (and they have very limited capital of their own, with high opportunity costs) and therefore have a much higher total marginal factor costs, shown by $TMFC_1$, leading to very much lower input use, which is often zero (as shown in figure 3.3.2). In such circumstances an input subsidy which substantially reduces the capital requirements and costs of input purchase can make input purchases possible for such households, as shown in figure 3.3.2 by a subsidised input marginal factor cost of $IMFC'$, leading to a lower Total Marginal Factor Cost ($TMFC'_1$) and input use of I'_1 . Note that the cost of the subsidy for these households is represented in figure 3.3.2 by the area $acdf$ (the quantity of input multiplied by the per unit subsidy) and a large proportion of this (the area between $TMFC'_1$ and $IMVP_s$) is directly stimulating extra input use.

Not all households, however, are credit constrained and face high capital costs in the same way. The situation for such households is shown in figure 3.3.3: the Total Marginal Factor Cost curve without the subsidy ($TMFC_2$) is only a little above society's Total Marginal Factor Cost ($TMFC_s$) so that for this household the subsidy leads to a new Total Marginal Factor Cost ($TMFC'_2$) below $TMFC_s$ so that their optimal input use at I'_2 is greater than the economic optimum I_s . The total cost of the subsidy to these households is ac_2d_2f , and of this only a very small proportion is directly stimulating extra input use (a part of $b_2c_2d_2e_2$, which is itself a small part of the total cost).

Figure 3.3.3 Marginal analysis for more and less capital constrained households



This analysis of the differential economic costs and benefits from directing input subsidies to farmers facing different constraints is important as it suggests that programme efficiency and effectiveness in stimulating increased input use can be improved by smart subsidies that reduce the quantities of input subsidies received by less constrained farmers. This can be achieved in two ways: by targeting and by rationing.

3.3.3. Targeting of input subsidies to specific household types

The analysis set out in figures 3.3.1 to 3.3.3 suggests that the efficiency of an input subsidy programme can be improved in two ways by targeting of the input subsidy to specific types of farmer, if this ensures that it is directed to farmers (a) who would otherwise (as a result of credit market or information failures) use very little or no inputs

somewhat with increasing quantities of inputs applied but the broad analysis presented here would not be affected if this were the case.

and (b) who will increase their input use substantially as a result of the subsidy. Condition (a) reduces the proportion of the input subsidy that is simply a transfer to producers who get cheaper inputs than they would have purchased anyway without the subsidy (with subsidised input purchases *displacing* unsubsidised purchases), while condition (b) means that those to whom the subsidy is targeted do use it to increase input use. The combination of condition (a) with (b) should also reduce incidences where a subsidy leads to overuse of inputs (beyond levels that are economically optimal).

The marginal analysis in figures 3.3.1 to 3.3.3 is however restricted in that it assumes that output prices are not affected by the subsidy, or, in terms of previous discussion, that output demand is perfectly elastic. This can be explored by introducing another (lower) MVP curve into figure 3.3.3 to represent the effects of lower output prices where a subsidy increases production and output demand is not perfectly elastic: this should have the effect of reducing input use ($I'(1)$ and $I'(2)$) somewhat. The effects of subsidy targeting where output demand is not perfectly elastic are, however, more helpfully explored by investigating targeted subsidy impacts on output supply and demand and on consumers and different producers, as in figure 3.3.4.

Figure 3.3.4 Targeted subsidy impacts on output supply and stakeholder welfare

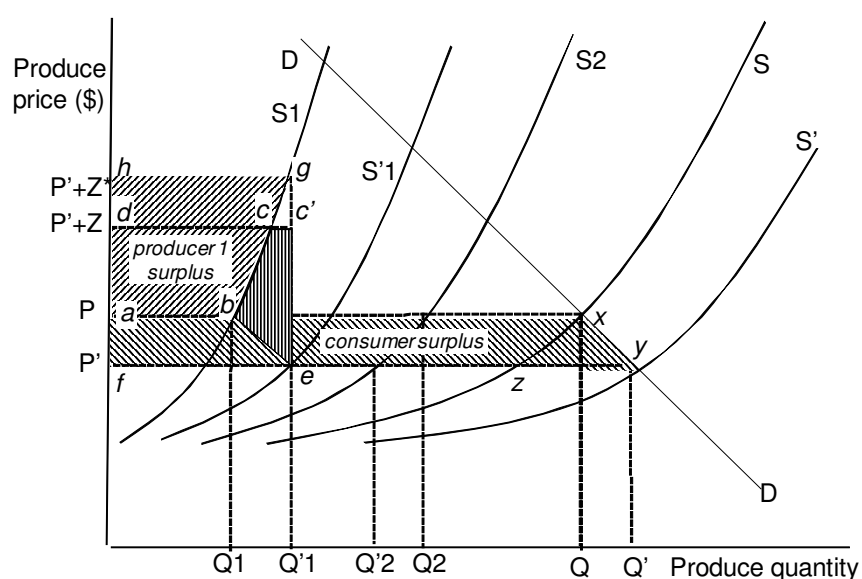


Figure 3.3.4 shows the effects of a targeted subsidy where the subsidy is provided to poorer, capital constrained producers with supply curve S_1 which shifts to S'_1 with an input subsidy which costs the government $\$Z$ per unit output but which effectively reduces production costs by $\$Z^*$ per unit output ($Z=Z^*$ unless the subsidy addresses a market or information failure in which case $Z < Z^*$, as shown in the figure). The result of this is an expansion of overall supply S to S' ($S = S_1 + S_2$ and $S' = S'_1 + S_2$, horizontal summation). The output price therefore falls, leading to a gain in consumer surplus as shown by $axyf$. Subsidised producers also gain producer surplus, as shown by 'producer 1 surplus' ($abgh$). The gain in consumer welfare is achieved largely as a result of a transfer from producers who experience a fall in producer surplus as a result of lower prices (with a net welfare loss for unsubsidised producers). The total cost of the subsidy (represented graphically by $fec'd$) therefore leads to producer and consumer welfare gains equal to the area shaded as producer 1 surplus plus the extra consumer surplus less the transfer from unsubsidised producers (xyz): the net gain from the subsidy is then the extra gain in producer surplus 1 due the difference between Z and Z' ($dcgh$ plus xyz) less the

deadweight cost (*bec'c*) and this will be determined by the extent of the market/information failure being addressed by the subsidy and on recipient and non recipient producer characteristics, and upon their relative numbers.

As compared with an untargeted subsidy (as represented in figure 2.1) it should be noted that not only is this likely to be more economically efficient and effective, it also involves a transfer from less poor producers and tax payers to poorer producers and consumers (assuming that the subsidy is increasing production of a staple food crop). It might be argued that less poor producers should be compensated for this – and allowing them access to the subsidy is one way of doing this. The extent to which less poor producers actually lose from a fall in producer prices depends upon alternative activities open to them (affecting elasticity of supply).

Much of course also depends upon the effectiveness of targeting and upon likely thresholds of minimum subsidy rates (or maximum input prices) for inputs to become affordable for poorer producers. These thresholds and political and power relations often result in smaller across the board subsidies being captured to a significant extent by less poor producers. In such circumstances poor consumers (some of whom may also be poor producers) will benefit if the subsidy leads to lower staple food prices, but any poor producers who are net produce sellers will lose from lower prices for their products.

The targeting of subsidized inputs to different groups or types of people is, however, a critical and sensitive issue, and there are significant costs and difficulties in targeting of subsidized inputs to different groups or types of people. In this it is helpful to distinguish between geographical targeting (between regions, districts and different geographically defined communities) and intra-community targeting (between different categories of people or households within communities). Geographical differences between areas and communities will often be correlated with socio-economic and cultural differences between these areas and communities. The distribution of subsidized inputs between different categories of people then depends upon the interaction of formal criteria determining geographical targeting and intra-community targeting together with 'informal' *de facto* criteria and mechanisms which are actually implemented. Costs of geographical targeting will generally be much lower than intra-community targeting. The relative effectiveness of these targeting approaches (in terms of inclusion and exclusion errors) depends upon inter- and intra- community differences and social, political and cultural factors. Targeting inevitably creates political tensions, with the relative threats posed by geographical and intra-community targeting again depending upon national, regional and local social, political and cultural factors. Targeting will also commonly lead to secondary markets for inputs where recipients sell subsidised inputs to non-recipients. The effects of such markets are discussed later in section 3.3.8.

The serious political, economic, welfare, and equity issues associated with targeting mean that targeting criteria and methods have to be constrained by political concerns and practicalities (at national, regional and community levels), by programme objectives (for example production, growth, or social protection objectives), and by the feasibility and costs of targeting. There may be arguments for comprehensive or area targeting that delivers smaller quantities of inputs (or of entitlements to inputs) to all households or farmers in a country or area.

A final comment on targeting is needed on the relative efficiencies of input use by poor and less poor producers. It is often thought that poorer producers make less efficient use of inputs than better off producers, and hence that targeting of input subsidies to poorer producers is less efficient than targeting them to less poor producers. It has been argued above that targeting poor producers has major benefits in terms of ensuring that subsidies address market failures (reducing displacement, and increasing welfare and distributional

benefits). These arguments will, however, be undermined if poor producers make less efficient use of inputs than less poor producers. It is therefore important to note here that there is a very large literature examining the relative efficiency of large and small smallholder farms, where larger farms are generally less poor than smaller farms (see for example Hazell et al, 2007). There is no universal relationship between farm size and efficiency, in some circumstances smaller, poorer farms are found to be more efficient, in other circumstances to be less efficient. However there is substantial empirical evidence supported by a continually evolving body of theory that smaller, poorer farms tend to be more efficient in the cultivation of labour intensive staple crops in poor rural economies, and larger farms tend to be more efficient in the cultivation of capital and market intensive higher value cash crops. This suggests that where input subsidies are aimed at promoting staple food production (where input subsidies are most likely to address market failures and promote wider consumer benefits as argued in section 2) then targeting them at poorer producers will often lead to greater production efficiency in their use as well as more efficient wider benefits.

3.3.4. Rationing of input subsidies

Analysis in section 3.3.2 of the differential economic costs and benefits from directing input subsidies to farmers facing different constraints suggested that smart subsidies which reduce the quantities of input subsidies received by less constrained farmers could improve programme efficiency and effectiveness in stimulating increased input use by targeting and by rationing. Having analysed the effects of targeting in section 3.3.3, we now turn to consider the effect of rationing, with or without targeting. For this we return to the marginal analysis used earlier in section 3.3.2.

Figure 3.3.5 Marginal analysis of rationing of input subsidies

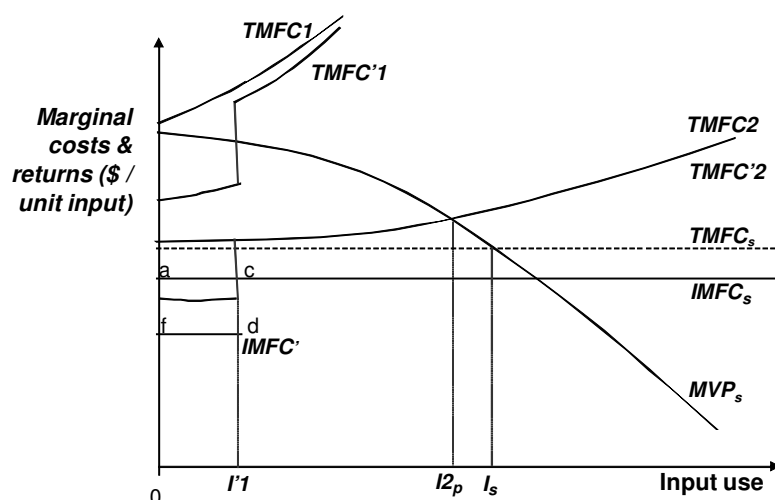
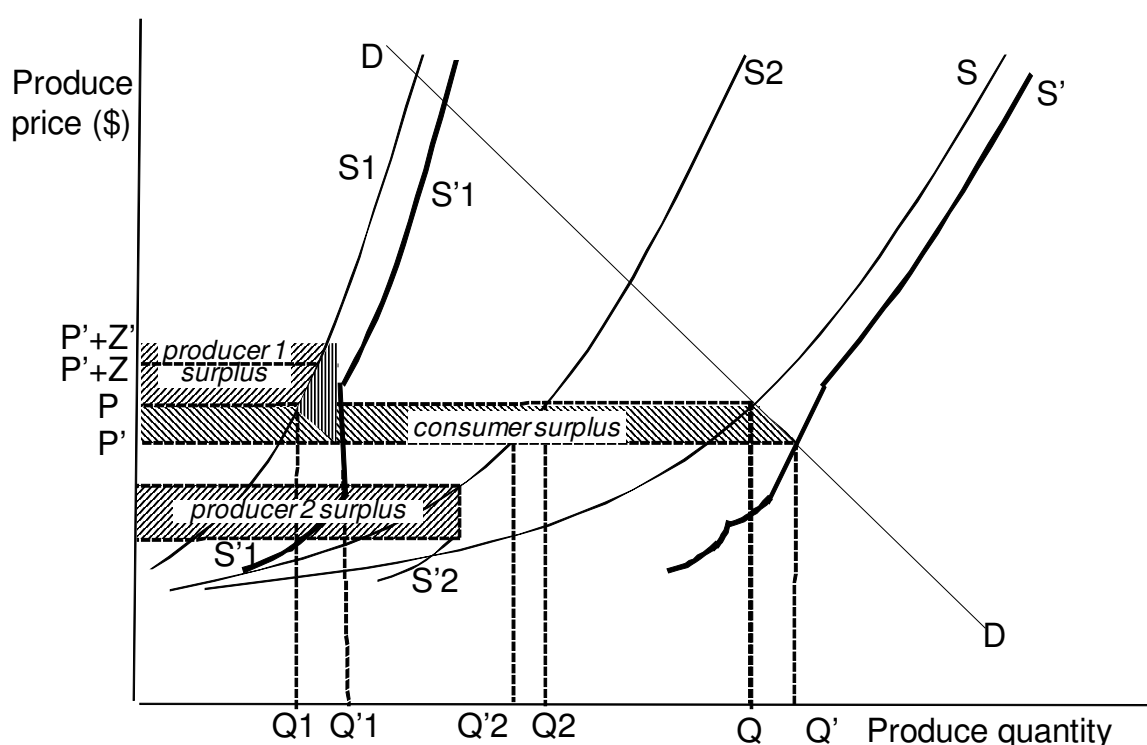


Figure 3.3.5 shows that a rationed input subsidy on $I'1$ inputs can stimulate input use and production for capital constrained households (raising input use from 0 to $I'1$) and that production by other households is unaffected (at $I2p$), with receipt of subsidised inputs displacing inputs that would have been bought anyway without any subsidy. Figure 3.3.6, analysing produce supply effects of a rationed subsidy, also shows that a rationed subsidy does not affect input use or production by less poor producers (for whom it displaces unsubsidised purchases), it only leads to increased input use and production by capital constrained producers. This drives down prices to the benefit of consumers at the expense of producers. Producer losses from lower prices are, however, offset by gains from receipt of the subsidy.

If the subsidy is targeted only to capital constrained producers this will lead to loss of welfare for other (less poor) producers, with substantial reductions in subsidy costs and limited impact on production or produce prices and hence increased economic efficiency of the programme (as compared with universal provision). There will, however, be political economy costs as less poor producers will be direct losers from the programme. We can also analyse contrasting situations where there is no explicit targeting of poorer producers and indeed poorer households have more limited access to the subsidy than less poor households in terms of de facto targeting to less poor households. This will lead to almost no incremental use inputs or production, no price changes or benefits to consumers, and effectively provide a straight income transfer from taxpayers to less poor producers.

Figure 3.3.6 Rationed subsidy impacts on output supply and stakeholder welfare



Rationing, whether targeted or universal, is only effective where there are no (or limited) secondary markets in which recipients sell subsidised inputs to non-recipients. The effects of such markets are discussed later in section 3.3.8.

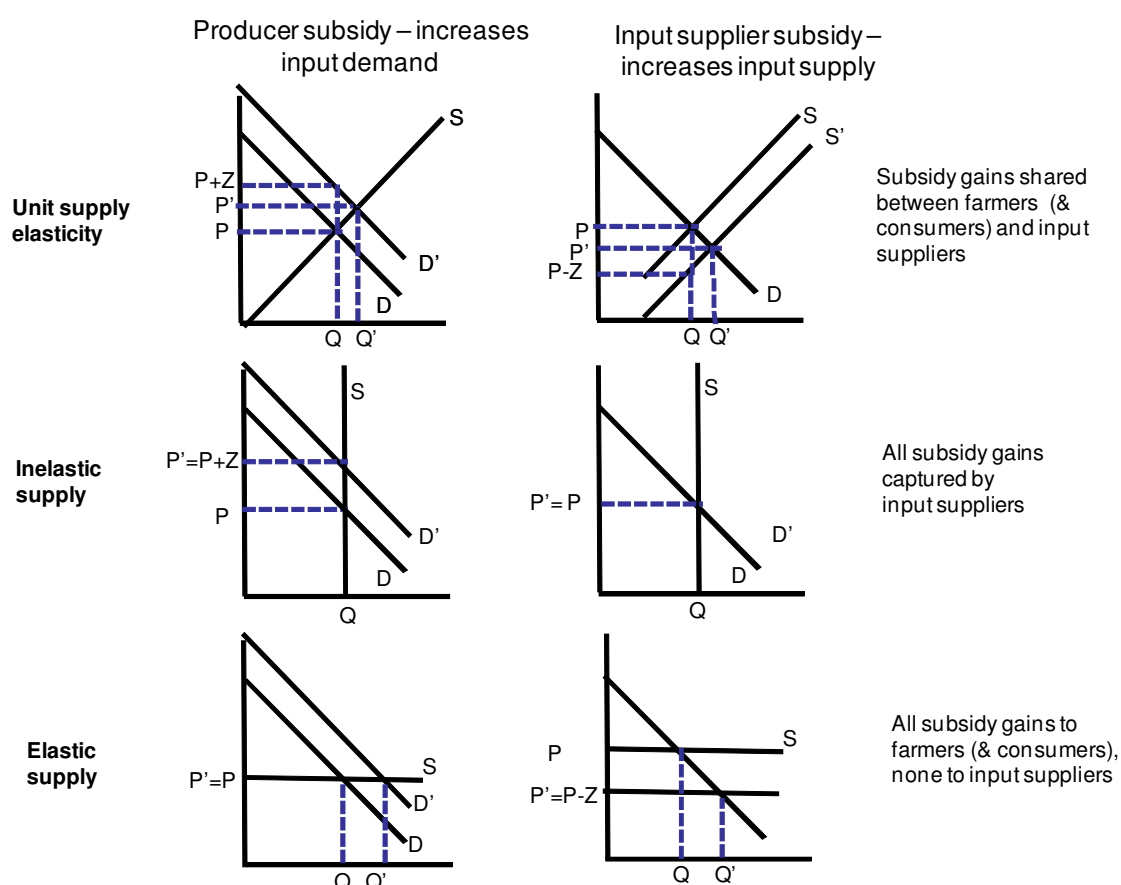
3.3.5. Effects of subsidies on input supply systems

Effective large scale input subsidies should lead to substantial increases in volumes of inputs purchased by farmers, and this can have a number of different impacts on input supply systems and markets. We consider three different beneficial processes and impacts, and two damaging process.

First, the short run effects of an input subsidy on the input market depend upon the nature of the subsidy and on the structure of the input supply system. If the subsidy is provided to farmers this has the effect of shifting input demand upwards. Alternatively input subsidies may be provided to input suppliers (India, for example, has used fertiliser subsidies to domestic producers to develop and protect its fertiliser industry, Fan et al 2007). The effects of this on the input market depend upon input supply elasticity, and this in turn will

depend upon structure, conduct and performance in domestic production and imports. This varies between countries and between different kinds of inputs. Few African countries produce fertiliser, with local fertiliser suppliers either importing blends or blending particular formulations from imported raw materials. Price elasticities for imported fertilisers should be very high, unless there are either significant importation costs and limited importation capacity (as may be the case for land locked countries, in which case increased input demand will bid up importation costs and revenues (rents) in importation, for example transport) or limited competition between importers (in which case increased input demand will bid up revenues (rents) of importers). The situation is often very different with seed supply, where imports are impeded by national seed certification controls and there is limited domestic capacity in seed production, with long multiplication lead times. Short and long run supply elasticities also differ (with greater long run elasticity). More elastic input supply leads to more of a subsidy accruing to producers (see figure 3.3.7), with gains for producers (and/ or consumers, as discussed earlier). More inelastic supply, whatever its cause, leads to increased subsidy capture by input suppliers and reduced benefits to producers and/or consumers. Clearly agricultural development benefits from input subsidies are increased by more elastic input supply and decreased by inelastic input supply.

Figure 3.3.7: Effects of different input supply elasticities



The second process by which input subsidies can impact beneficially on input supply systems involves first the realisation of economies of scale across the industry and within particular suppliers (as a result of increased volumes) and second the benefits of competition in increasing efficiency and reducing marketing margins where increased

volumes attract new entrants into the input supply business. These benefits should accrue to both subsidised and unsubsidised supplies of the same inputs, and expand supply, pushing supply curves down and to the right, with increasing supply elasticity. These processes of realising economies of scale and competition of course depend upon the nature of the inputs and their supply systems, and upon the ways in which subsidised inputs are acquired and disbursed (for example through general price support, voucher systems or direct issue with distribution involving government institutions, input supplier cartels, or competitive input markets). It should be noted that government supply is not incompatible with realisation of economies of scale in subsidised input disbursement, but the spillovers to unsubsidised sales are likely to be limited (unless government also markets these) and lack of competition faced by government organisations (and by cartels) tends to undermine the achievement of such economies.

The third process by which input subsidies can impact beneficially on input supply systems results from the ways that increased input supply and transactions may promote the development of new relationships and forms of relationships among input sellers and buyers in poor rural areas with, for example interlocking arrangements for linking input sellers, seasonal finance providers and produce buyers. Again these processes are critically dependent upon the nature of the inputs and their supply systems, and upon the ways in which subsidised inputs are disbursed, as discussed above. This process can also contribute to wider economic and market activity as increased input market activities have potential spill-overs into other markets (for example expansion of a network selling subsidised inputs may also buy and sell other commodities).

The impacts of input subsidies on input supply systems are not, however, always beneficial. Damaging effects can arise in two main ways.

First, input subsidies may create considerable uncertainty and risks for input suppliers and directly undermine the incentives for private investment in input supply systems. This occurs most obviously when governments intervene directly in input markets through direct supply of subsidised inputs and/or through regulation of input markets. Direct supply of subsidised inputs by government may take away business from private suppliers if there is significant displacement of unsubsidised sales by subsidised sales (and, as discussed earlier, this is common), leading to unsold stocks and lower sales volumes to carry fixed costs²⁰. Regulation of input markets may restrict prices or volumes, or require sales of unprofitable lines or in unprofitable locations – again restricting revenues and increasing costs and risks. .

A second way in which subsidies may damage the development of input supply systems is by distorting incentives so that input suppliers are distracted from investing to compete to expand profitable sales and instead divert resources and investments into competing to expand government contracts to provide subsidised inputs²¹. Unless subsidies are carefully designed to address and indeed exploit this, such investments are unlikely to lead to the development of longer term sustainable supply systems.

²⁰ An extreme case of this can arise if access to subsidies is very uncertain or deliveries are very late, such that farmers do not purchase unsubsidised inputs because they expect to obtain subsidised inputs, but then cannot obtain subsidised inputs (either because they are deemed ineligible for the subsidy or because the subsidised inputs do not arrive on time, in sufficient quantities, or in good condition). In such circumstances a subsidy can not only displace unsubsidised inputs but can actually depress total input demand and use.

²¹ There is anecdotal evidence that this may have affected input suppliers in Zimbabwe (concentrating on providing relief inputs subsidised by international donors in the early 2000's) and in Ghana (investing in relations with government for the 2008 subsidy). There is no suggestion that any of these involved corrupt behaviour, but such behaviour demonstrates more extreme incentive distortions.

The implications of this discussion are that subsidy programmes need to be carefully designed and implemented to promote supply system development in key areas where it needs development, and that long term stable relationships of trust need to be developed between governments and private sector – but these must also promote efficiency. Quick exits and unstable, changeable subsidy programmes are unlikely to induce the private sector investments necessary for supply system development.

3.3.6. Dynamic effects of subsidies on growth

Discussion of subsidy impacts in sections 3.3.2 to 3.3.4 has been largely concerned with ‘static’ impacts, considering the direct impacts of subsidies on producer costs and decisions, hence on produce supply and prices, and consumer welfare. ‘Dynamic impacts’ of subsidies on producer knowledge of input benefits and on more efficient use of inputs were mentioned in section 2 as a means by which input subsidies can overcome information failures to induce long term change in perceived and actual input profitability and use, allowing subsidies to be withdrawn as producers using subsidised inputs learn about the benefits of inputs and about their efficient use. Such dynamic effects are an important part of conventional thinking about subsidies, and continue to be relevant, though as argued in section 3.3.1 lack of knowledge of the benefits of some inputs (such as fertilisers) is less important now than it was in the past. Similarly section 3.3.5 considered some dynamic effects of input subsidies on the development of input supply systems alongside more static concerns about the distribution of subsidy benefits between input suppliers and producers.

There are, however, two important potential dynamic benefits of subsidies that have been given much less emphasis in conventional thinking about subsidies.

First, subsidies that are effective in raising land and labour productivity (with overall increases in on-farm labour demand) and in driving down food staples prices (as examined in consideration of output supply effects in sections 2 and 3.3.1 to 3.3.4), will raise the real incomes of large numbers of poor consumers as well as raise the incomes of poor producers, and this should expand demand for locally produced non-staple foods (horticultural and animal products) and non-farm goods and services, driving up local labour demand and wages. At the same time increasing staple crop productivity can release resources for the production of non-staple foods (horticultural and animal products) and non-farm goods and services. Such growth multipliers were critical in driving growth in Asia (Hazell and Rosegrant, 2000) and need to be given much greater emphasis in analysis of input subsidy impacts, in particular this requires more emphasis on subsidy impact on food prices and poor consumers or net buyers. It also requires implementation of subsidies over a longer period, to achieve structural change rather than short term productivity gains.

Dorward (2009) describes three dimensions of development: the need for individuals and households, communities and wider economies to maintain their welfare (termed ‘hanging in’), a process of advancement by ‘stepping up’ existing activities by expanding their scale or making them more efficient, and a process of advancement by ‘stepping out’ into new activities. Both ‘stepping up’ and ‘stepping out’ require coordination across and between different scales of economic organisation (so that necessary production inputs and services are available, and so that growing supply is matched by growing demand). They also require a reasonable expectation of ability to ‘hang in’, so that investment in stepping up and stepping out are not overly constrained by allocation of resources to low productivity hanging in activities. Where agricultural input subsidies contribute to raised land and labour productivity in staple food production, reduced food prices and raised producer incomes they are contributing to coordinated hanging in, stepping up and

stepping out in low income rural economies, and thus can play a very dynamic role in promoting wider development, growth and poverty reduction.

The second way that input subsidies can have important potential dynamic benefits is through their stimulation of increased input and output and wider economic activity (as described above) then having positive spillover effects with 'market thickening'. This happens if the greater volume economic activity stimulated by the subsidy reduces coordination and transaction costs and risks and promotes institutional and communications and transport service and infrastructure development (see Dorward et al 2009, Dorward and Kydd 2004, Dorward et al 2004).

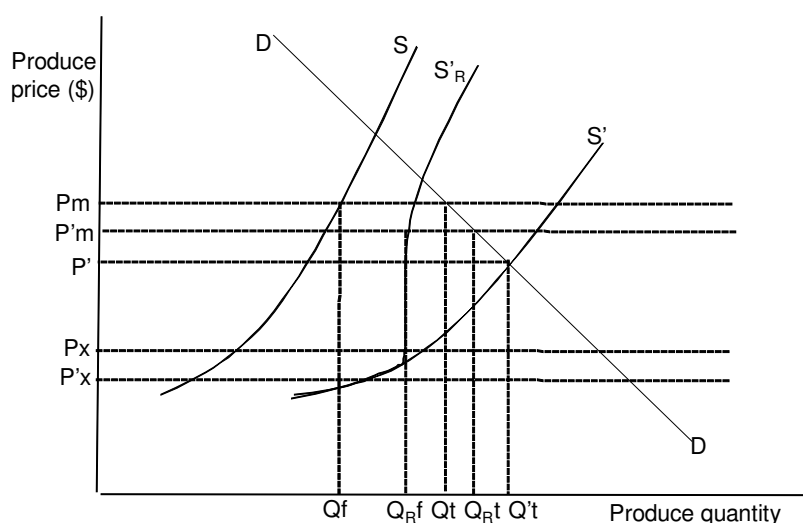
Both these potential dynamic benefits of subsidies require longer term and stable implementation of subsidies to induce behavioural and structural change.

3.3.7. Subsistence production and net deficit producers

The analysis of input subsidy impacts on output supply and stakeholder welfare (for example in figures 2.1, 3.3.4 and 3.3.6) analyse separately subsidy impacts on output producers and consumers, linked by their interactions in the market. This analysis is, of course, highly stylised. While there is evidence that many staple food markets in southern and eastern Africa are generally reasonably well integrated (Abdulai, 2007), they also tend to be characterised by high margins which inhibit exchange and incentives for surplus production (eg Barrett 2008). This, together with variable staple food prices and limited off farm income opportunities, leads to substantial subsistence production and very large numbers of African farmers (around 50%) who are poor deficit staple food producers and net staple food buyers (Barrett 2008). Such farmers are both producers who can utilise an input subsidy and consumers who benefit from lower food prices.

Figure 3.3.8 presents a formal analysis of the within-household effects of subsidy receipt, showing the unsubsidised situation with domestic staple food demand D and own supply S , and market purchase price P_m and sales price P_x . The household produces Q_f from its own farm and purchases $Q_t - Q_f$. A widespread subsidy leads to a fall in purchase and sales prices (P'_m and P'_x) and own supply shifts to S' . The household now produces all it needs (Q'_t) at a cost of P' and neither sells nor buys staple food. There is a substantial increase in producer and consumer welfare (and demand may shift as a result of higher income).

Figure 3.3.8: Within household input subsidy impacts on food supply and welfare



The effects of a rationed subsidy are shown in figure 3.3.8 by the supply curve S'_R with own production of Q_{Rf} , total consumption of Q_{Rt} , and purchases of $Q_{Rt}-Q_{Rf}$ ²².

The relative positions of D and S, the impact of the subsidy and situation of the household as autarchic or a net buyer or seller will differ between households according to household composition (consumers and workers), and access to land and capital. Subsidy impacts in production and consumption by many households will not be fully reflected by changes in quantities bought and sold in food markets, and this may dampen market effects of subsidies when measured in absolute terms. However the significant quantities of produce that are consumed within farm households without reaching markets also means that produce markets may be very thin, so that small % changes in production can lead to very large % changes in market supply and demand, making markets very unstable. This can be important for understanding the food market impacts of input subsidies (and indeed of any policy or natural events that affect smallholder production).

3.3.8. Leakages and secondary markets

Leakages were discussed earlier in section 2 in terms of cross crop, cross farmer and cross border leakages. These are closely related to the development of secondary markets where recipients of subsidised inputs sell their inputs to others, normally at prices that are discounted as compared with unsubsidised inputs. Such markets may arise with targeted and rationed subsidies, as subsidy recipients sell subsidised inputs to others as a result of differences in access to and needs for working capital (with poorer, capital constrained farmers selling inputs to less poor farmers) and/or differences in perceived marginal benefits to input use (with farmers with more land, for example, requiring larger quantities of inputs and looking for discounted prices).

It is often argued that secondary markets should not be impeded because (a) farmers generally know what is best for them and (b) attempts to limit secondary markets generally lead to (poorer) sellers of inputs into these markets getting lower prices while (less poor) buyers and middlemen get higher prices – with regressive distributional effects as less poor buyers and middlemen capture a large share of subsidy benefits. Such arguments lead on to a related question that is often raised with regard to input subsidies: would it not be better to give poor producers cash rather than an input subsidy and let them choose what to do with the money? This is an important question as social protection and welfare policy make increasing use of cash transfers which avoid the significant inefficiencies and leakages common in subsidy administration and secondary markets.

These are important considerations. There are, however, other significant arguments that suggest that secondary markets can fundamentally undermine input subsidy programmes' wider benefits. At the heart of both conventional and more recent arguments for input subsidies are information and market failures and externalities, all of which cause individually optimising farmers to make decisions that are sub-optimal or inefficient in meeting the goals of wider society. A well designed and effectively implemented input subsidy programme can address four interacting sets of information and market failure and externality problems together:

- Farmers' under-valuation of the benefits of input use to themselves as individuals and to society, as a result of inadequate information on the effects of inputs when properly used and on efficient ways to use them – an information failure considered in sections 2 and 3.3.1;

²² Prices with the rationed subsidy are for simple exposition shown as P'_m and P'_x but in fact would not be expected to fall as much as with a full, unrationed subsidy and should be between P_m and P'_m and between P_x and P'_x respectively.

- Poorer farmers inability to obtain seasonal working and consumption capital, or ability to obtain it only at much higher cost than the social opportunity cost of such capital – a credit market failure considered in section 3.3.2;
- Farmers not benefiting directly from economies of scale when increased input volumes reduce input supply costs and margins - a non-market externality that arises from increasing returns to scale, considered in section 3.3.5; and
- Farmers not benefiting directly from lower output prices and consequent dynamic pro-poor growth effects of subsidies which raise staple food production and productivity – a ‘market externality’.

If cash transfers replace input subsidies, or secondary markets are encouraged, then welfare transfers can be delivered more efficiently to subsidy beneficiaries (subsidy recipients and/or staple food consumers) but cash transfers are unlikely to be able to address as efficiently at least three of the four information and market failure and externality problems described above²³. This is because allowing people more unconstrained market choices cannot address those externality and information and market failure problems which arise precisely because private and social interests are misaligned. Policy choices between cash transfers and input subsidies with or without constraints on secondary market operation therefore need to take account of specific policy objectives; of the nature of the informational, market, externality and distributional problems that need to be addressed; and of alternative instruments and combinations of complementary instruments that may be used.

This discussion of the role of subsidies in addressing information and market failures and externalities has important implications not only for thinking and policies on secondary markets but also on farmer choice within subsidy programmes. It is sometimes argued that voucher systems can and should be used to extend farmer choice, with fixed value vouchers being redeemable for different inputs which farmers may choose between. This empowers farmers, and allows them to use the subsidy to invest in inputs that they consider will make the largest contribution to their livelihoods. The effectiveness with which subsidies address information and market failures and externalities may, however, require some restrictions on farmer choice, to ensure that their choices align with wider social efficiency objectives.

3.3.9. Entitlement and distribution systems

Any targeting or rationing system requires a method for restricting access to subsidised inputs. This requires a list or specification of entitled beneficiaries with specification of their subsidised input entitlement and then a mechanism that allows them to access that entitlement. This mechanism may involve either physical distribution of inputs from a specified distribution point against a list of entitled beneficiaries held at that distribution point, with some form of secure identification, or separate distribution of evidence of entitlement which can then be ‘redeemed’ by the beneficiary at authorised input retail outlets. Evidence of entitlement is most commonly a paper voucher, but scratch cards and electronic systems involving bank cards, electronic ‘smart’ cards and mobile phones may also be used. Since entitlements have considerable financial value, vouchers or cards need to be very secure as regards prevention of counterfeit fraud (with secure printing processes and print features and/or real time, secure and centralised monitoring of allocated and redeemed entitlements). Different systems offer different potential benefits but pose different political, technical, administrative and social challenges within communities and households (the use of biometric information, for example, raises

²³ One would expect cash transfers to address seasonal credit market failures, but Gregory (2006) and Dorward (2006) suggest that this may not be the case as input subsidies may help with ‘enforced savings’ as money savings are too fungible.

questions about intra-household control over input subsidy entitlements; electronic systems must be able to operate in areas with no electricity, and some require reliable mobile phone network access and expensive equipment).

Entitlements may be input specific (entitling the beneficiary to a particular quantity of a particular input on payment of a top up) or flexible (entitling the beneficiary to choose between a limited range of specified inputs on payment of a top up). They may also be fixed value (with the top up varying when used in different locations or outlets or, with flexible vouchers, when used for different inputs) or be associated with a fixed top up (where the top up paid by the beneficiary is constant but the value of the subsidy varies, when redeemed by the retail outlet). Flexible vouchers are normally also fixed value vouchers. There are important interactions between types of vouchers, secondary markets, recipient choice (of inputs and suppliers), control of fraud and of programme costs, and gendered access to and control of subsidised inputs within households.

3.3.10. Complementary integration, investments and policies

Positive impacts from input subsidies are determined by the on-farm physical productivity of inputs; by input supply system efficiency, transport and communication systems and costs; and by output market efficiency (as these affect marginal value products of input use, output supply curves and shifts, and output demand curves and elasticities) – as well as by the effectiveness and efficiency of implementation of the subsidy programme itself. Programme impacts can therefore often be enhanced by complementary investments in agricultural research and extension that can raise input productivity; by subsidies for complementary inputs (for example seeds *and* fertilisers); and by investments in road, communications, and market infrastructure and service development. Programme effectiveness and efficiency can also be improved by designing and implementing subsidy and other policy instruments in ways that are complementary (for example cash transfer or cash for work programmes may be linked to subsidy entitlement systems to facilitate participation by and benefit for very poor producers, or subsidy entitlements may be linked to and incentivise investments in soil and water conservation). Complementary development of staple food markets is an area of complementary policy that is particularly important given the way that major subsidy benefits involve consumers' accessing food at lower prices.

3.3.11. Soil fertility replenishment

As noted earlier, one of the reasons put forward for fertiliser subsidies is the need to combat the alarming decline in soil nutrients in many parts of Africa and the need for (and benefits of) their replenishment. Crawford et al 2006 summarise soil fertility problems in terms of declining fallows, rapid deforestation, land degradation, and declining nitrogen, phosphate and potassium levels in arable soils. Subsidies to promote the application of fertilisers may then be justified in terms of externalities from increasing fertiliser application where fertiliser use, higher soil fertility and higher farm yields provide a number of benefits to society rather than to individual farmers: reductions in soil erosion and downstream flooding and siltation, in deforestation and CO₂ emissions, and in soil and wider ecosystem and biodiversity loss as a result of reduced pressures to cultivate marginal and fragile land; and reductions in poverty and in rural-urban migration, and hence in wider social costs of addressing rural and urban poverty as a result of increased farm and rural incomes (Sánchez et al., 1997). It may also be argued that poverty and food insecurity cause many African farmers to place a higher value on short term income and food production and a lower value on longer term investments in soil fertility and other types of natural capital (as compared with their value to wider society), again leading to

under investment in soil fertility and a justification for subsidies to promote investments in better soil management.

3.3.12. Political economy issues

Another important set of issues affecting the implementation and outcomes of input subsidy programmes concern domestic and international political contexts and processes. These are given increasing recognition in agricultural development policy analysis (see for example Birner and Resnick, 2005; Cabral and Scoones, 2006; World Bank, 2007) but detailed analyses of study of policy processes in input subsidy programmes are less common (Chinsinga, 2006, and Dorward et al, 2008 are exceptions). Political processes are, however, extremely important for input subsidy programmes.

Large scale input subsidy programmes are extremely costly, they represent very significant transfers to subsidy recipients, and they offer opportunities for very substantial captures of rents by a variety of stakeholders (politicians, programme administrators, input suppliers, traders, and less poor farmers).

As a result, political economy difficulties with large scale input subsidies are found in almost all countries where subsidies are implemented. Thus in OECD countries agricultural subsidies (not specifically input subsidies) are widely recognised to be inefficient but have continued because they serve particular political interests. Input subsidies (fertiliser and electricity for example) persist for similar reasons in many Asian countries after they have served their role of kick starting rural growth, despite being extremely costly.

Political economy difficulties can, however, be particularly problematic in poorer rural economies where (a) there are very substantial economic opportunity costs from the diversion of scarce fiscal resources to input subsidies and away from other productive investments (such as agricultural research or infrastructural development) and (b) potential personal and political gains from subsidy rents are very large relative to other income, patronage and rent seeking opportunities in the economy. A paradox arises in that while substantial political commitment is needed for large scale input subsidies to be implemented, the political objectives behind such commitment will often focus around or be shifted towards short term patronage opportunities. Unfortunately, however, pursuit of these opportunities tends to undermine the economic efficiency and wider pro-poor growth benefits of input subsidies - by directing subsidies to less poor recipients with more political voice, directing subsidies towards cash crops, undermining competition and efficiency in input delivery systems, and increasing leakages and non-transparent secondary markets. These difficulties are particularly prevalent in political systems with significant neo-patrimonial elements, as is common in many poorer rural economies, particularly in Africa (van de Walle, 1999).

A second paradox related to political economy also arises with regard to the importance of stable, continuing and longer term subsidies if they are to lead to supply system development and wider dynamic changes in rural economies (as discussed earlier in sections 3.3.5 and 3.3.6). While this carries important benefits it also carries important risks, as if subsidies are not set up with clear time limits and if they continue for long periods then already substantial risks of their being politically entrenched and 'hijacked' are increased. Similarly the longer subsidies are in place and the more stable the subsidy systems, the greater the opportunities for those wishing to perpetrate fraud and divert subsidies to find ways of doing so. There is therefore a substantial challenge in finding ways of promoting stability and trust for farmers and input suppliers while at the same time specifying clear exit mechanisms and rules (to reduce risks of political capture) and varying systems (to reduce fraud).

Understanding and addressing political economy issues in agricultural input subsidies is a difficult but very important issue. A key part of this is understanding the diverse legitimate and illegitimate interests and powers of different stakeholders (for example farmers with different livelihoods; produce buyers, sellers and consumers; tax payers; local and national politicians; technicians; donors; input supply businesses and employees; civil society; government and private organisations and their managers, traditional leaders), as they relate to personal, local, organisational and wider political, financial, economic and symbolic²⁴ constraints and objectives.

3.4. Rethinking input subsidies: conclusions and conceptual frameworks

The review in previous sections of new thinking and its implications allows us to identify new insights about the potential pitfalls and practice of smart subsidies and to draw out first the key elements of input subsidy programmes and second the major impacts that they may have. This then defines issues to be considered in evaluating them.

3.4.1. Key elements of input subsidy programmes

The ‘success’ of an input subsidy programme has to be judged against the objectives of that programme. Input subsidy programmes can and do have a wide range of different possible objectives as set out in table 3.4.1.

Table 3.4.1. Possible input subsidy programme objectives

1	Wider (pro-poor) economic growth
2	Consumer benefits - lower output prices, access (emphasis on poorer consumers?)
3	National / household food self sufficiency / security
4	Input adoption
5	Input use efficiency
6	Addressing the price productivity tightrope
7	Producer welfare (emphasis on poorer producers?)
8	Input supply system development & efficiency
9	Rents (supplier, producer, administrative, political)
10	Soil fertility replenishment
11	Political benefits (personal, party, etc)

Note: these objectives are not arranged in any order of priority or importance

Most of these objectives are mutually complementary. . However our analysis suggests that objective (1) in table 3.4.1 (a contribution to wider, pro-poor, economic growth) should normally be important and using the terminology of Dorward (2009) this will be supported by contributions to ‘hanging in’ from improved national and household food security (objective 3 in table 3.4.1); by contributions to ‘stepping up’ from increased input adoption, efficiency in use, attention to the price productivity tightrope, improved producer welfare, and input supply system development (4 to 8); by contributions to ‘stepping out’ from attention to the price productivity tightrope, improved producer welfare, and input

²⁴ ‘Symbolic’ constraints and opportunities are those that while not apparently technocratically rational are pursued because they have significant symbolic importance. Examples include national food self-sufficiency – this may or may not be an economically efficient way of ensuring national food security, but in some countries it has significant symbolic political importance. Avoiding of weakness or devaluation of national currency is another example of a symbolic objective in some countries.

supply system development (6 to 8); and by contributions to all three of these transformations from soil fertility replenishment and from political benefits that support commitment of resources to effective and efficient subsidy implementation (10 and 11). However some objectives in table 3.4.1 may also be to a greater or lesser extent mutually incompatible (for example 2 and 7 may in some cases be incompatible, and pursuit of 9 is generally incompatible with many of the other objectives – although some rents may be necessary for political economy purposes to allow a subsidy to be implemented). It is also important to note that stated formal programme objectives may differ from the objectives of individual stakeholders.

Given that the identification and prioritisation of objectives will be different in different situations, the balance of programme objectives should then determine the key design and implementation elements of input subsidy programmes. These are summarised in Table 3.4.2.

Table 3.4.2. Key design and implementation elements of input subsidy programmes

1	Basic subsidy system (focus on consumer or producer benefits, direct recipients)
2	Product focus – staple foods, cash crops, etc
3	Scale – beneficiary coverage
4	Subsidy per beneficiary
5	Total volumes subsidised
6	Voucher or other entitlement systems, distribution and input access systems and timing
7	Rationing – objectives, methods
8	Targeting (if rationing) – objectives, criteria and methods
9	Input supply systems (involvement of parastatal and /or private wholesale and retail suppliers) and timing
10	Secondary market and leakage policies (and enforcement mechanisms)
11	Complementary integration and investments and policies

These elements have all been discussed explicitly or implicitly in earlier sections, which have suggested that input subsidies will generally (but not always) yield the greatest returns where they focus on consumer benefits and on indirect gains to pro-poor economic growth from increased food staple productivity, where they operate at a large enough scale (in terms of the number of beneficiaries, the subsidy per beneficiary and the total subsidised volumes) to lower staple produce prices - but with rationing and targeting criteria and methods which direct subsidised inputs to producers whose productive input use is constrained by market failures which can be overcome or substantially reduced through the subsidy. Such rationing and targeting will normally be best achieved by various forms of voucher systems which enable cost effective and timely input distribution, which support sustainable unsubsidised (commercial) input supply system development, and which limit secondary market development and leakages. Effective implementation of these various elements will normally require coordinated complementary investments and policies supporting infrastructural development, agricultural research and development, and efficient output markets offering lower and more stable staple prices to consumers.

However as should also be clear from these sections, these elements are also highly inter-related, with many synergies and trade-offs. These interactions are most easily identified around the themes of scale and scope: large scale subsidy programmes offer wider supply side benefits (in input supply system development, in consumer and dynamic

pro-poor growth impacts) but make effective, timely and efficient programme management more difficult and can crowd out complementary investments needed for higher productivity of input use. Different entitlement, targeting and rationing systems are effectively attempts to control the scale of subsidy programmes by directing limited resources to their most productive uses – but these are themselves often difficult and costly to implement. Indeed there is something of a paradox here, that it is in the application of targeted subsidies to input use on staple foods in poor rural areas that such subsidies both offer the greatest potential benefits and pose the greatest implementation, resourcing and coordination challenges (Dorward et al, 2009).

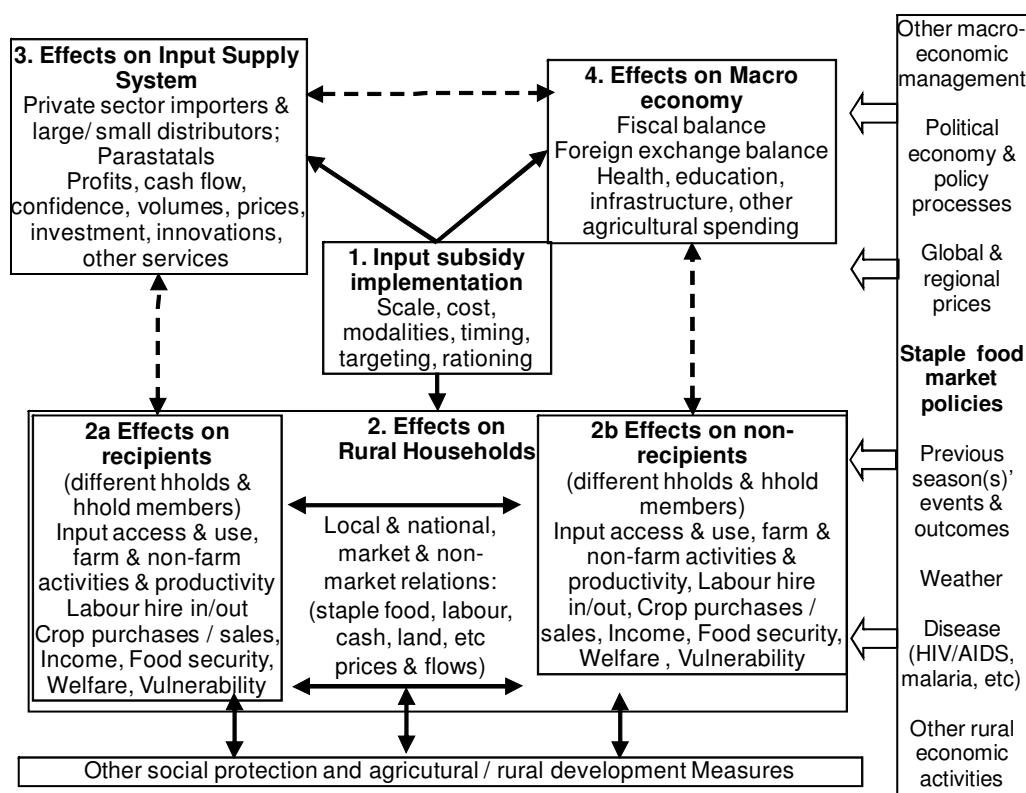
The list of subsidy programme objectives and elements in tables 3.4.1 and 3.4.2 provide a useful set of criteria for characterising and evaluating different types of subsidy adopted by different countries at different times.

3.4.2. Key input subsidy programme impacts

Identification of critical issues to be considered when evaluating input subsidy programmes must be informed by an understanding of (a) programme objectives and (b) the processes by which programme investments, activities and objectives are related.

Figure 3.4.1 provides a conceptual framework that draws on the analysis and issues addressed in sections 3.3.1 to 3.3.12 to identify key variables and relationships affecting input subsidy programme impacts.

Figure 3.4.1 A conceptual framework for investigating agricultural input subsidies impacts



(adapted from SOAS et al, 2008)

This framework in turn helps to identify critical outcomes that subsidy programmes may (or may not) deliver. These are summarised in Table 3.4.3.

Table 3.4.3. Potential outcomes of input subsidy programmes

1	Timing
2	Performance monitoring and audit systems
3	Input leakage, displacement
4	Incremental input use
5	Incremental production
6	Increased productivity
7	Output price changes (producer and consumer prices)
8	Input price changes
9	Labour market changes (hired labour demand, wages)
10	Programme cost / benefit analysis (fiscal, economic)
11	Welfare and growth impacts
12	Macroeconomic effects
13	Input supply system impacts
14	Soil fertility replenishment

Tales 3.4.1, 3.4.2 and 3.4.3 then define key issues to be considered in evaluating input subsidy programmes as regards their objectives, their design and implementation and their impacts.

4. Recent experience with input subsidies

Having considered key features of input subsidy programmes (their potential impacts, objectives and features) we now turn to examine recent experience with their implementation. As noted earlier, there has been resurgent interest in input subsidies, in particular ‘smart subsidies’ for fertilisers in Africa. High food and fertiliser prices in the first part of 2008 added to this, with many reports of new or expanding subsidy programmes in different countries around the world. IFDC, towards the end of 2008, reported new, expanding or continuing subsidy programmes in China, India, Philippines, Sri Lanka, Indonesia, Ghana, Nigeria and Malawi (<http://www.ifdc.org/focusonfertilizer8.html>). Other countries for which there are reports of new or expanded fertiliser subsidy programmes include Tanzania, Kenya, Rwanda, Mali, Senegal, and Bangladesh. Unfortunately there are very few detailed and rigorous evaluations of most of these programmes – indeed it is often difficult to find even very basic information about them: ‘recent experience with input subsidies’ is difficult to review. This lack of information is not surprising – given the ongoing emergence of many of these programmes and national rather than donor ownership.

We therefore summarise observations from an examination of 10 fertiliser subsidy programmes in Africa, all except one of these implemented since the turn of the century. These have been selected on the basis of (a) availability of information and (b) representation of a range of different approaches to and types of subsidy programme²⁵.

²⁵ A very large number of programmes and projects could be considered as providing some form of ‘input subsidy’ if this is interpreted in its widest sense as some form of public investment promoting input use, as, for example, agricultural research and extension, agrodealer development, market development and rural road building are all forms of public investment that may be intended to directly or indirectly promote agricultural input use. The programmes considered are restricted to those that provide some direct subsidy to input supply *operations* (beyond input supply system *development*, although they may – and hopefully will - contribute to input supply system development as well)

Table 4.1 lists the 10 programmes and summarises the information available on each against key issues identified earlier in tables 3.4.1, 3.4.2 and 3.4.3. Before considering the insights from this table and what it can teach us as regards general patterns of subsidy programme objectives, design, implementation and impacts we first briefly describe each of the programmes considered in table 4.1.

4.1. Programme descriptions

4.1.1. Ghana

In early 2008 Ghana faced high food prices and rising fertiliser prices and the government and large fertiliser importers (who had significant but high priced fertiliser stocks) discussed the potential and possible modalities for a national fertiliser subsidy programme. Press reports (Ghana News Agency 9th June 2008, 3rd July 2008) indicate that the programme was formally announced in June 2008 and operated from July to December. A total of 30,000 tonnes of four types of fertiliser was made available by three major importers, with pan territorial farmer prices representing an approximate 50% subsidy, at a total cost of around US\$15 million²⁶. Large numbers of vouchers (over 1 million) were printed against planned subsidy sales of 600,000 bags. Deliveries were late for the cropping season in the south of the country (April to July), but were more timely for the north, and this may account for lower uptake and fertiliser sales in the south and use on a wider range of minor crops as compared with the north where there was more substantial uptake and use mainly on maize.

Vouchers were distributed by Ministry of Agriculture staff, with wide variation in approaches, systems and numbers across different areas, and limited information to field level staff on the total number of vouchers that they would receive for distribution. Redemption prices varied geographically to provide pan-territorial farmer prices in district capitals, but this tended to discourage suppliers from supplying fertilisers outside district capitals as neither redemption nor farmer prices covered costs of transport outside district capitals. No subsidy sales were made by (smaller) distributors independent of the major fertiliser importers (indeed in the north unsubsidised sales were reported to be banned completely).

Information on the Ghana 2008 fertiliser is obtained largely from Banful (2008).

4.1.2. Zambia Fertilizer Support Programme (FSP)

Zambia has been implementing fertiliser subsidies for a long period, but the current programme was initiated in 2002, and disburses an average of over 66,000mt of subsidised fertiliser per year. This is imported by private companies under government tender and then distributed to farmers through cooperative societies (Xu et al, 2008). There is anecdotal, press and survey evidence that substantial quantities of subsidised fertilisers are diverted from cooperatives and smallholder farmers to fertiliser traders, who then sell it at unsubsidised prices. The subsidised fertiliser that does reach smallholder farmers tends to go to less poor farmers (who, on efficiency grounds, are explicitly targeted by the programme) and may lead to substantial displacement (Minde et al, 2008). Nevertheless the programme is estimated to yield an economic cost benefit ratio that is greater than 1, though this is lower than might be achieved by alternative investments in longer term research or infrastructural programmes (Jayne et al, 2007). There has been substantial political controversy regarding the implementation of the 2008/9 programme.

²⁶ Total budgeted subsidy cost was \$25 million but only about \$15 million was directly for the subsidy inputs and voucher costs (pers. comm., Afua Branoah Banful).

Table 4.1. Key features of reviewed input subsidy programmes

		Ghana	Zambia FSP	Kenya NAAIP	Malawi AISP	Malawi TIP	Malawi Starter Pack	Sasakawa Global 2000 (Ethiopia)	Millennium Villages (Malawi, Kenya)	Malawi SPLIFA	Nigeria: DAIMINA
	Year	Jul-Dec 2008	2002 onwards	2007 onwards	2005/6 onwards	2000/1-2004/5	1998/9-1999/2000		2006/7 onwards	2003/4 - 2004/5	2004
	Source(s)		Minde et al (2009)	Sikobe (2008)	SOAS et al (2008)	Levy (2002, 2005)	Levy (2002, 2005)	Crawford et al (2006)	Buse et al (2008)	Gregory (2009)	Gregory (2009)
Stated Objectives											
1	Wider (pro-poor) economic growth							long run aspiration	long run aspiration		
2	Consumer benefits (lower output prices, access)										
3	National / household food self sufficiency / security	yes	latterly - increased maize production	hh food security/availability	yes	targeted hh		long run	hh /village food security	hh food security	
4	Input adoption	yes	initially remote smallholders	yes	remote capital constrained farmers		yes	yes	yes		
5	Input use efficiency			yes				yes			
6	Addressing the price productivity tightrope										
7	Producer welfare (emphasis on poorer producers?)	yes (not apparent)	yes (not apparent)	yes	stated in later years	food insecure producers	food insecure producers	yes	yes	food insecure producers	yes
8	Input supply system development & efficiency		yes	yes		increasingly recognised				yes	yes
9	Soil fertility replenishment								??		
10	Political benefits (not stated)	yes	yes	yes	yes	yes	yes				

Table 4.1. Key features of reviewed input subsidy programmes (cont)

		Ghana	Zambia FSP	Kenya NAAIP	Malawi AISP	Malawi TIP	Malawi Starter Pack	Sasakawa Global 2000 (Ethiopia)	Millennium Villages (Malawi, Kenya)	Malawi SPLIFA	Nigeria: DAIMINA
Design & implementation											
1	Basic subsidy system (focus & direct recipients)	producers	producers, but significant supplier capture	producers, agro-dealers	producers	subsistence producers	subsistence producers	producers	subsistence producers	subsistence producers & suppliers	producer (25%) & supplier (50% 60 day trade credit, training)
2	Product focus – staple foods, cash crops, etc?	staples intended but wide use	staples	staples	mainly staples	staples	staples	staples	staples	staples	
3	Scale?	national scale	national	36000 hh (2007) plan 2.5 million farmers	national programme, >1.5 million hh	targeted 25%+ hh	universal	max 650,000 farmers	project villages	100,000 hh	pilot
4	Subsidy / beneficiary?	50% costs	50% costs	100% on inputs for approx 0.4ha	60 to 90% on inputs for approx 0.4ha	100% on inputs for approx 0.08ha	100% on inputs for approx 0.1ha		100% on inputs for approx 0.4ha	100% on inputs for approx 0.4ha	25% subsidy on cash purchases
5	Volume subsidised?	30,000 tons of fertilizer, US\$15 million	66,000mt average pa	plan 250,000mt fertiliser	130 to 220,000 tonnes fertiliser, US\$50-200 million,	11,000 to 50,000 tonnes fertiliser	42,000 to 44,000 tonnes fertiliser				385 mt fertiliser
6	Voucher or other entitlement systems, distribution & input access systems	vouchers	subsidised sales by cooperatives	vouchers	vouchers	physical distribution initially, moved to vouchers	physical distribution initially, moved to vouchers	physical distribution	physical distribution?	vouchers for work	vouchers
7	Targeting – objectives, criteria and methods	None	farmers with 1 to 5 ha (less poor 60%)	resource poor with land; disadvantaged; potential group members	poorer productive farmers (highly variable in practice)	ineffective targeting of poor /vulnerable farmers	universal	more (potentially) productive farmers in more productive areas	geographical (site selection)	self / community targeting, food insecure	
8	Rationing	intended fixed quantity / hhold, not consistently enforced		fixed quantity per farm hh	fixed quantity per farm hh	fixed quantity per farm hh	fixed quantity per farm hh	fixed quantity per farm hh	fixed quantity per farm hh	fixed quantity per farm hh	
9	Input supply systems	Importer supply system	cooperatives supplied by private imports	private retailers/ agrodealers	mixed, mainly parastatal & large private importers /retailers	mixed, mainly private importers	mixed, mainly private importers	mixed - including part government owned importers/ distributors		small agrodealers, supplies arranged by IFDC	small agrodealers , 50% trade credit
10	Secondary market and leakage policies	formally prohibited			prohibited	prohibited	prohibited				
11	Complementary integration & investments & policies	no		extension, cereal banks, group work (planned)	some subsidised legume seed but supply shortages			credit, extension, floor prices	extension, health, education, community development	agrodealer extension training, road construction	

Table 4.1. Key features of reviewed input subsidy programmes (cont)

		Ghana	Zambia FSP	Kenya NAAIP	Malawi AISP	Malawi TIP	Malawi Starter Pack	Sasakawa Global 2000 (Ethiopia)	Millennium Villages (Malawi, Kenya)	Malawi SPLIFA	Nigeria: DAIMINA
Outcomes											
1	Timing	voucher issues July to Oct, late in south	70% ok	n/a	last minute and later than optimum input delivery, has improved	sometimes last minute/ late	sometimes later than optimum input delivery	generally good though lower costs if earlier	good	late input deliveries	improved timeliness
2	Internal monitoring & audit systems	not reported	not reported	M&E planned	internal M&E, limited audit systems	independent & internal M&E	independent & internal M&E	some evaluation Howard et al 1999	yes	dealer & farmer surveys	dealer & farmer surveys
3	Input leakage, displacement	some leakage to other crops	substantial - ? 70% leakage in 2007/8, 40% displacement		limited leakage info, displacement with less poor beneficiaries & cash crop use: 20-40%	low displacement estimates	limited leakage info, low displacement estimates			limited; monitoring & transparency / accountability in community	
4	Incremental input use	in regions with timely delivery	variable - 60% if reaches smallholders?		60-80% for fertilisers, unknown for seeds	no specific estimates	no specific estimates	Yes	substantial incremental input use reported	yes	Yes
5	Incremental production		Yes - but could be more		approx 30-40% maize production increase?	40 - 350,000 mt maize?	350- 500,000mt maize?	Yes	substantial reported	yes, but poor weather& late deliveries	Yes
6	Increased productivity		some		as above	40 to 125kg maize /hh	170 kg maize /hh	Yes	substantial incremental land & hh productivity reported	yes, see above	
7	Output price changes (producer & consumer prices)		modified by marketing policies		low prices only after 2005/6, modified by marketing policies	very limited - some high price years	Yes, also with good rains	large price fall led to credit defaults			
8	Unsubsidised input price changes		No		No	reduction in import costs /margins during implementation					
9	Labour market changes (hired labour demand, wages)				following 2005/6 subsidy					yes (limited scale)	
10	Programme cost / benefit analysis (fiscal, economic)		C:B ratio >=1.07		potential to be >1 depending on yield gains & input & output prices. Fiscal efficiency depends on displacement rates	range of food security benefits and savings of emergency imports		Economic CBA >1 if extra production reduces imports, but not for export. Doubtful in less favourable areas			
11	Welfare and growth impacts				productivity gain benefits but often consumer losses from higher maize prices	limited social protection, divisive targeting	lower maize prices		improved hh welfare reported	improved beneficiary food security (less for female headed hh),improved roads	
12	Macro economic effects				significant budget impacts in 2008/9	limited	limited	limited	none	none	none
13	Input supply system impacts	negative except large importers	negative		importers gain, agrodeales excluded from fertiliser supply, instability gives limited sustainable gains	private input suppliers (fertiliser importers, seed companies, retailers and agro dealers) grew during starter pack & TIP implementation		some crowding out of credit systems & independent distributors & retailers		increased trust from customers, dealer business benefits	expanded farmer demand, dealer profits, turnover & system sustainability
14	Soil fertility improved										

4.1.3. Kenya National Accelerated Agricultural Input Programme (NAAIP)

In 2007 the Kenya government decided to embark upon a National Accelerated Agricultural Input Programme to promote food security, agricultural input use, input market development, and agricultural productivity. Initially planned to subsidise fertilisers and maize seed for a limited number of districts, it has subsequently been expanded to national coverage with plans to provide 2.5 million farmers with maize seed and fertilisers for 0.4 ha each, with vouchers issued to targeted farmers (disadvantaged households with land) and subsequent redemption through private input sellers who would also be eligible for trade credit guarantees. Farmers will also benefit from linked extension, cereal banks, warehouse receipts, and participation in farmer groups (Sikobe, 2008). It has not been possible to access information on outcomes from the programme, but the programme is included in our review as an example of large scale programme design and implementation aspirations.

4.1.4. Malawi Agricultural Input Subsidy Programme (AISP), Targeted Input Programme (TIP) and Starter Pack Programme (SP)

Malawi has implemented a series of different national input subsidy programmes over the last 10 years, which have been supported by extensive monitoring and evaluation activities and have attracted considerable international interest.

In the 1998/99 and 1999/2000 agricultural seasons the Malawi Government, with donor support, implemented a large scale programme under which all farm households in Malawi received an input 'starter pack' comprising 15 kg of fertiliser, 2 kg of maize seed and some legume seed. With good rains, Malawi had large harvests these years. From 2000/2001 the programme was scaled down to the 'targeted input programme' (TIP) with a smaller quantity of fertiliser (10kg) per beneficiary and targeted selection of beneficiaries. With poor rains and later delivery of inputs in some years, national production was very low with severe food shortages in 2001/2 and 2005/6 – and consequent large scale expansion of the number of TIP beneficiaries in these years. From 2005/6, however, the government has taken a different approach with a very large scale programme (the Agricultural Input Subsidy Programme or AISP) providing about 50% of farm households with vouchers for 100kg of fertiliser and small quantities of maize (and latterly legume) seed, with mainly privately imported fertilisers delivered principally, and in some years exclusively, by two parastatal input suppliers. Levy and Barahona (2002) and Levy (2005) report extensively on the TIP and its predecessor the starter pack programme, while SOAS (2008) and Dorward and Chirwa (2009) review the (ongoing) AISP and have estimated positive returns to the 2006/7 programme depending upon prices, and implementation effectiveness and efficiency, with potential for very large returns or losses. Dorward et al (2008) provide historical and political context to these programmes.

4.1.5. Sasakawa Global 2000

During the 1990s the Sasakawa Global 2000 implemented a number of projects in different African countries under which farmers were given assistance in acquiring inputs on demonstration plots. We report here on experience in a major scaling up of this in Ethiopia as reported by Howard et al 1999.

4.1.6. Millennium Villages

The Millennium Villages Project has established integrated projects in selected villages to demonstrate the substantial changes that are possible with significant investments in health, agriculture and community development. A major part of this is the provision of subsidised agricultural inputs (seed and fertiliser). Although the projects have only been established relatively recently, monitoring and evaluation systems are in place and we

draw on reports from Kenya and Malawi (Buse et al, 2008; Denning et al, 2009). This approach has similarities with the Sasakawa Global 2000 approach in that it has invested in relatively small scale, localised input subsidy programmes with much wider objectives of national scaling up.

4.1.7. Malawi Sustaining Productive Livelihoods through Inputs for Assets (SPLIFA)

For two years when the Targeted Input Programme was being implemented in Malawi, IFDC and partners also implemented an innovative project (Sustaining Productive Livelihoods through Inputs for Assets or SPLIFA) under which food insecure households in particular communities were provided with input vouchers as payment for public works. These vouchers could be redeemed at local agro-dealers, who were also supported with technical training, delivery of inputs, and a commission for voucher redemption (Gregory, 2006). This project is of interest as an early use of vouchers with specific objectives to simultaneously support both agrodealer (input supply) development and food security among poor subsistence producers.

4.1.8. Nigeria Developing Agricultural Inputs Markets in Nigeria (DAIMINA)

The Developing Agricultural Inputs Markets in Nigeria (DAIMINA) project, also implemented by IFDC, also used vouchers to pursue twin objectives of agrodealer development and increased producer access to and use of inputs (Gregory, 2006). Like the Malawi SPLIFA project, this was relatively small scale, but instead of providing free inputs to poor food insecure households it tested the use of vouchers within a much larger national fertiliser subsidy programme. The standard national programme purchased fertiliser from importers and then distributed to state level blenders and agricultural development programmes. This national programme, however, undermined the development of private sector, commercial sales, and suffered from substantial leakages and non-payments from states to the federal government. DAIMINA trialled the use of vouchers to allow small agrodealers to deliver subsidised fertiliser to farmers.

4.2. Lessons from reviewed programmes

Table 4.1 summarised information available for each of the 10 reviewed programmes against the major issues identified as important for subsidy programme evaluation. We consider these under the main headings of programme objectives, programme design and implementation, and programme outcomes.

4.2.1. Programme objectives

The first part of table 4.1 shows for each of the 10 reviewed programmes the stated objectives of the programme²⁷. Here we consider how far the different possible programme objectives are found in the different programmes and types of programme.

- food security (household or national), input adoption, and producer welfare are found as objectives of all or almost all programmes (with variation as regards particular emphasis on poorer or food insecure producers)
- not one of the programmes explicitly recognises the potential for producer subsidies to benefit poor consumers²⁸, except subsistence producers, and related to this there is no recognition of the potential role of subsidies in addressing the price-productivity tight rope and only in the Sasakawa 2000 and MVP is there a wider recognition of the potential role of subsidies in driving forward pro-poor

²⁷ Political objectives were not stated but are inferred from context, design and implementation. .

²⁸ It may be that inclusion of recent programmes in Mali or Senegal (if information were available) would have provided examples of programmes with an explicit objective to reduce consumer prices.

growth: even here there is no explicit consideration of the mechanisms by which this may be achieved²⁹

- input use efficiency, input supply system development and soil fertility replenishment are only explicitly considered as programme objectives for particular programmes or types of programme
- political considerations are important for all of the large scale programmes (Ghana, Zambia, Kenya and Malawi).

4.2.2. Design and implementation

Design and implementation features of the different programmes are shown in the second part of table 4.1.

There is broad commonality across the different programmes as regards:

- the basic focus of subsidy systems on producers as major (and generally sole) direct subsidy recipients;
- a primary focus on subsidising inputs for staple food production (for subsistence production or for sale into domestic markets) ;
- very substantial subsidised input price reductions (of 50% or more for all programmes except DAIMINA), consistent with measures to address both affordability and profitability constraints to input use;
- all programmes rationing (or attempting to ration) the quantity of subsidised inputs to be received per household, with vouchers being a common (but not universal) means of achieving this; and
- use of private sector importers to provide basic fertiliser supplies.

There are differences across the programmes as regards:

- scale, with some national programmes and others piloting potential national programmes;
- targeting, with some programmes focussing on food insecure/ vulnerable households and others seeking to maximise production by focussing on less poor households (although this may be misguided if (a) smaller, poorer farms are more efficient (Hazell et al, 2007) or (b) displacement is higher with less poor households);
- use of vouchers for targeting, rationing, and/or supply system development;
- private sector involvement (and nature of involvement) in distribution;
- complementary policies, and their links to programme objectives.

4.2.3. Programme outcomes

Different programme outcomes – or information gaps about particular outcomes – are closely related to programme objectives. Thus limited examples of subsidies leading to output (food staple) price changes and the lack of information on labour demands and markets and longer term and wider welfare and growth impacts are not surprising. Similarly the lack of information on soil fertility replenishment is consistent with the lack of emphasis on this in programme objectives. There are, however, other similarities in outcomes that cut across differences in programme objectives, notably common (but not universal) problems with late input delivery in subsidy programmes (problems which are not confined to larger scale programmes) and common (and again not universal) lack of information on leakages (although such information is very difficult to collect and verify). Both of these are important for programme impacts, irrespective of programme objectives. Overall there appear to be large potential benefits from effective and efficient input

²⁹ Other programmes may also implicitly consider that increased productivity and producer welfare may drive forward growth, but consideration of the food price, non-staple and non-farm production and demand mechanisms is absent.

subsidy implementation – but also the potential for large economic losses. However it is very difficult to estimate indirect benefits from lower food prices, but there is little information on output price impacts for most programmes, and lower prices have ambiguous effects: lower food prices lower returns as estimated from conventional cost:benefit analysis but should increase the wider economic benefits from the programme if these lead to indirect benefits from growth linkages or multipliers; in Ethiopia lower output prices as a result of increased production led to farmer losses and the collapse of the programme.

There are also, of course, substantial differences across programmes, some of these related to differences in programme objectives, as noted above. Thus different welfare and growth impacts are related to differences in interest in these impacts, as are some differences in input supply system impacts. However programmes with the intention of developing supply systems may actually undermine them, if poorly designed and implemented: it appears that larger scale programmes have tended to damage the commercial interests of local fertiliser distributors while offering benefits to fertiliser importers. Similarly differences in incremental input use, production, and productivity (fairly universal objectives) are determined more by differences in design and implementation effectiveness and efficiency.

While all the programmes have some external reporting (otherwise they could not be included in this review), there are marked differences in reported performance monitoring and audit systems. There are also very few programmes for which information on economic or fiscal returns are estimated (and where these are available they were provided by external reviews). This may be linked to the emphasis on production in programme objectives – though again information on production does not seem to be universally important.

4.3. Conclusions from recent experience

A number of observations from the limited programmes reviewed here warrant particular emphasis:

First, it is notable how difficult it is to find comprehensive reviews of subsidy programmes, despite the substantial number of programmes that have been or are being implemented across Africa and the very substantial investments of public funds in these programmes. There is an important need for country studies to document country experiences, using the conceptual framework developed in this paper.

Second, there is a strong tendency for programmes to focus on production objectives and producer welfare, and to ignore the interests of consumers and the processes (and necessary conditions) for subsidy programmes to contribute to wider pro-poor economic growth. This is a critical omission, and is linked to the limited extent that the design and implementation of many programmes are integrated with complementary investments. Such integration is needed first for subsidy programmes to effectively deliver their stated objectives of incremental production, and then for them to contribute to wider processes of pro-poor growth. Recognition of the importance of consumer price benefits and of the price productivity tightrope is particularly important here.

Third, and related to the previous two points, there appears in some programmes to be an unfortunate lack of interest in improving effectiveness and efficiency. This is evident from the limited monitoring, evaluation and audit systems in some programmes, limited cost benefit and fiscal efficiency analysis, and limited attention to possible problems of displacement and leakage. This may be related to political economy issues (as discussed earlier in section 3.3.12). As will be discussed below (in section 5), growing challenges in

a changing world will make it even more important that governments improve the efficiency and effectiveness of input subsidy programmes in both raising productivity and promoting wider pro-poor growth within and beyond agriculture.

Two notable commonalities observed across programmes are (a) the lack or limited focus on replenishing soil fertility and (b) a strong (almost universal) prevalence of heavy subsidies (50% to 100% subsidy rates) on rationed inputs. This commonality occurs despite differences between programmes as regards first relative emphasis on improving national food security (and total input use and production) as against improving household food security (and helping food insecure households) and second relative emphasis on supply system development.

5. Subsidy programmes in a changing world

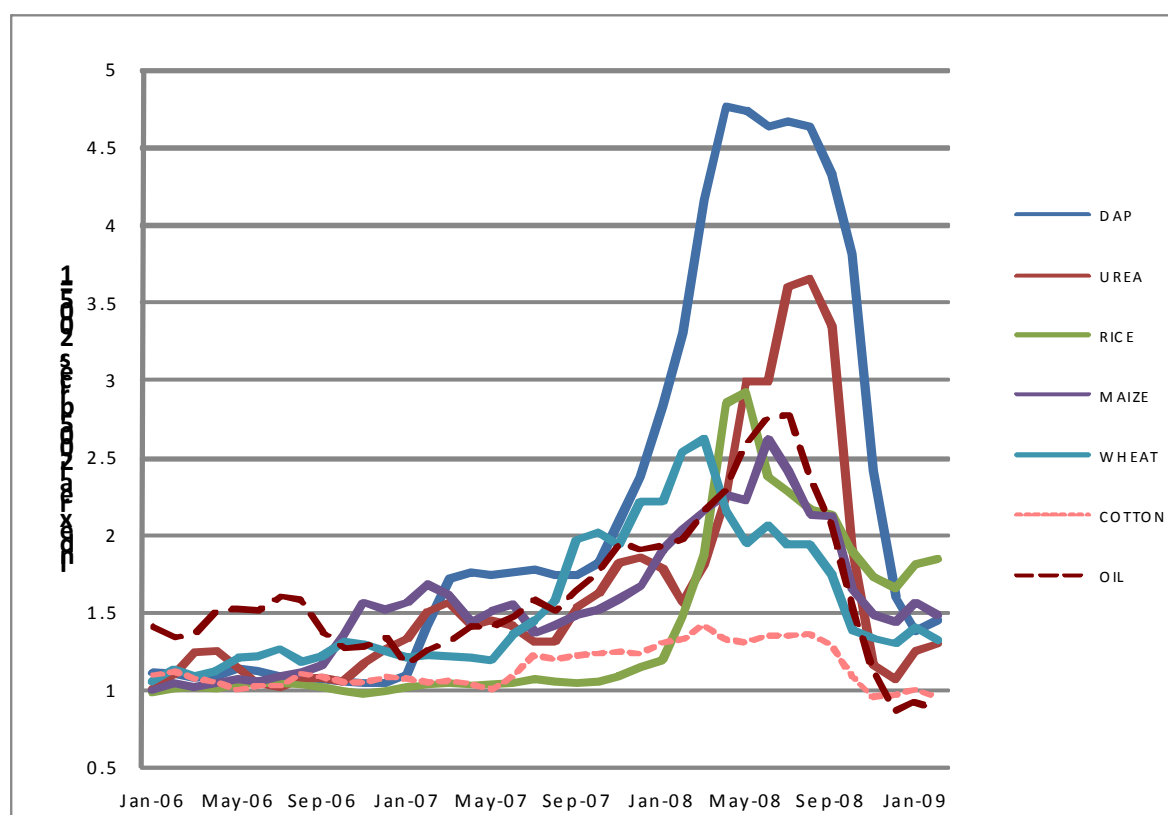
At the time when this review was conceived, global food and fertiliser prices were at almost unprecedented high levels, and a significant focus of the review was to be on the way that high food and fertiliser prices affected the benefits and costs of input subsidy programmes. Global food and fertiliser prices have, however, fallen right back since then, as shown in figure 5.1, though domestic food and fertiliser prices remain high in many countries and international phosphate fertiliser prices have not fallen back as far as food and nitrogen fertiliser prices. The international credit crunch has also led to a global economic slow down. Looking back, the high food prices in mid 2008 are seen to result from the coincidence of a number of different processes and events: a steady decline in global agricultural investment, in production growth and in food stocks; weather events in some grain producing areas; changing agricultural and environmental policies in many developed economies (including subsidies for biofuels); high oil prices; and complex international commodity market behavior, including financial speculation, physical hoarding, and national protectionism. Similar processes affected fertiliser prices. Paradoxically, interactions of these same processes together with the financial collapse then caused prices to fall again. The principal lesson that needs to be drawn from this is that we appear to live in a world with increasingly volatile and unpredictable markets and, with climate change, changing and more unpredictable weather. What are the implications of this for large scale input subsidy programmes?

We address this question by first considering separately the effects of high food prices and of high fertiliser prices. We then examine the effects of interactions of price volatility between food and fertiliser prices, and conclude our discussion with consideration of the impacts of climate change.

5.1. Impacts of high food prices

Before we examine the impacts of high food prices for agricultural input subsidies, we must first briefly consider the effects of high food prices on poor rural economies and the people within them. Impacts will vary for different people, and most obvious negative impacts will be on poor consumers who are connected to global markets – for example poor consumers whose staple food is imported grain of some sort. For consumers a rise in staple food prices leads to a fall in real income – the extent of the fall increasing with the importance of staple food expenditures in total expenditures, as illustrated in table 5.1.

**Figure 5.1. Commodity price indices 2006 to February 2009
(2005 prices, 2005=1)**



Source: World Bank data

Table 5.1 Effects of 100% increase in staple food prices on total expenditures for high and low income households (illustrative figures)

	Income	Initial expenditures			Expenditures after price rise			
		food expenditure		balance non-food	food expenditure		balance non-food	
		% initial hh expenditure	\$		\$	% initial hh expenditure	\$	change
High	7500	10	750	6750	1500	20%	6000	-11%
Low	2500	30	750	1750	1500	60%	1000	-43%
Very low	1500	50	750	750	1500	100%	0	-100%
Extremely low	1000	70	700	300	1400	140%	-400	-233%

Loss of real income has immediate effects on expenditures and consumption, welfare, and liquidity, and long term effects as a result of reduced expenditure on education, nutrition and health. In addition the reduced real incomes and expenditures of large numbers of poor people will reduce aggregate demand and economic growth.

It is often argued that opposite effects will be experienced by food producers, but this is not the case as most poor producers, and indeed around 50% of all producers in much of Africa, are net buyers of food (in that they do not produce enough food for their annual

requirements, and hence rely on the market to purchase food, see for example Barrett 2008). Such people are affected in a similar way as the consumers described above with the added problem that the consequent liquidity problems affect their seasonal investments in agriculture, in food production – poor households often have a backward sloping supply curve (see for example Dorward, 2006). Less poor farmers may also suffer (or at least not benefit) from higher food prices as much of their income may come from cash crops and non-staple animal and crop products (rather than staple food crops) and demand and prices for these may be depressed.

These considerations suggest that the poverty impacts of the 2008 food price hike may be considerably greater than the 100 million (around 10%) estimated increase reported by Ivanic and Martin (2008) as their estimate was based on 2007 price increases and also ignored the liquidity effects discussed above, and balance of payment, inflation and other macro-economic effects. It also assumed that higher food prices lead to rural wage increases (whereas in the poorest economies with large numbers of food deficit producers high food prices can reduce rural wages – again see for example Dorward, 2006).

This analysis, together with the analysis of potential subsidy impacts in earlier parts of this paper, suggests that high food prices substantially increase the potential benefits of well designed and implemented agricultural input subsidy programmes. Such programmes should address the affordability problems of input use which (for poorer, food insecure producers) are exacerbated by high food prices (although profitability problems in input are of course diminished by high food prices), and increase the importance of input subsidies' potential contributions to addressing the food price – productivity tightrope and to stimulating dynamic pro-poor growth and structural change. Such situations may also improve the alignment between political economy and economic growth objectives of input subsidy programmes.

5.2. Impacts of high fertiliser prices

The impacts of high fertiliser prices on poor rural economies have been discussed by Dorward and Poulton (2008) and are summarised here. Again we need to consider different impacts on different types of people within poor rural economies.

Farmers are likely to be very exposed to high international fertiliser prices as most poor rural economies import fertilisers from the world market: they are then hurt by high fertiliser prices in terms both of the profitability of fertiliser use and the affordability of fertiliser purchases – the latter issue, as argued earlier in section 3.3.2, very important and easily overlooked. Profitability problems may be offset by product price increases – but, for example, although food prices rose markedly in 2008 (though not as much as fertiliser prices), prices for cash crops (on which much fertiliser is used in Africa) were largely static – and average returns of fertiliser use on such crops were already not very high (Meertens, 2005). This may lead to political pressures for fertiliser subsidies for cash crops (from influential constituents) although the analysis earlier in this paper (in sections 2 and 3) suggested that input subsidies should yield higher returns when applied to staple crops as compared with cash crops. Here input subsidies may have a critical role to play as without them input use on food production may fall, increasing domestic prices, with all the attendant problems described above in section 5.1 – including further exacerbation of the affordability constraints to input use.

However, while high input prices may increase the need for input subsidies, they also undermine their short term returns (as measured by cost benefit analysis) and undermine a nation's ability to afford them. The former issue arises because high input prices reduce the profitability of input use, the latter issue arises because national economies may be

undermined by reductions in growth as a result of reduced agricultural production while the foreign exchange balance may suffer from both more expensive inputs and reduced export volumes – these macro-economic problems will of course depend upon the importance in the economy of different forms of agriculture and of agriculture as a whole, and on the importance, performance and terms of trade of other sectors. However Ethiopia provides an example of a country where high fertiliser prices exacerbated foreign exchange difficulties which were then addressed by an IDA grant and credit totalling US\$ 250 million to provide foreign exchange (but not domestic currency) for importation of fertilisers (World Bank 2008). There are, therefore, close parallels between the threats and paradoxes posed to individual farmers by high fertiliser prices and those posed to national economies.

Fertiliser suppliers may also be adversely affected by high fertiliser prices. While producers may enjoy large increases in profits if prices rise more than costs, the impacts on fertiliser traders and importers are more ambiguous and often negative. Traders with large stocks will gain if increasing fertiliser prices allow them to increase sales prices of existing stocks. However they may suffer from reduced sales volumes if higher prices lead to reduced demand by farmers (as discussed above) and they may also find it difficult to raise the working capital to buy more expensive fertiliser stocks. Traders may also suffer from falls in fertiliser prices if they have bought when prices are high and hold high price stocks while competitors can bring in lower price stocks.

Fertiliser prices have subsequently fallen back from the peak prices of mid 2008, but prospects for future prices are uncertain. Some observers predict increasing concentration among suppliers (Roy, 2009) and there are fears that carbon taxes and/or increasing oil prices may again push fertiliser prices up in the future.

5.3. Interactions of price volatility between food and fertiliser prices

What are the implications for input subsidy programmes of interactions of price volatility between food and fertiliser prices?

Food and fertiliser prices may interact in a number of ways over different time periods. First, changes in the global economy and in global markets may impact them both in similar ways – for example high oil prices may simultaneously push up fertiliser prices (as energy costs are a major component of nitrogen fertiliser production costs) and, through increased biofuel demand, also push up grain (particularly maize or corn) prices. Commodity speculation may also push up food and fertiliser prices together. Similarly, but over a different time span, credit difficulties may reduce both investment in fertiliser production plants and investment in fertiliser use for food production. High fertiliser prices may also lead to reduced food production in the subsequent season – and high food prices should push up fertiliser demand (if commercial farmers are not credit constrained) and hence fertiliser prices.

These positive interactions between fertiliser and food prices may, however, also be offset by normal supply and demand responses to high prices. These are also, on the other hand, affected by seasonal time lags, which complicate the planning and management of input subsidy programmes. This may be illustrated by Malawi's experience with input subsidies in 2007/8 and 2008/9. Rapid food and fertiliser price rises in international markets in late 2007 and early 2008 meant that relatively low priced fertiliser (bought in the middle of 2007) was used to produce maize harvested in mid 2008 when international prices were very high – yielding a very high estimate of economic returns from the input subsidy programme. For the 2008/9 programme, however, fertilisers were bought when prices were very high, but the maize produced by those fertilisers will be harvested in March to May 2009, when, based on current prices, international maize prices are

expected to be very low – and as a result the 2008/9 programme may yield a very low estimated economic return (Dorward and Chirwa, 2009). Such temporal difficulties, together with the wider economic and balance of payments effects of fluctuating input and food prices, are likely to make management and control of input subsidy programme expenditures very difficult, and similar difficulties will be faced in attempts to stabilize food prices – while in section 3.3.6 it was argued that the complementary management of input programs and staple food price stabilization policies is critical for achievement of longer term economic growth benefits from input subsidy programmes.

As another complication, general uncertainty in fertiliser and other commodity markets, and the potential for this to increase the likelihood of political interventions, also increases fertiliser traders' and importers' risks Dorward and Poulton (2008).

5.4. Impacts of climate change

Climate change will have varied and difficult to predict impacts on agriculture in Africa. Average annual rainfall may increase or decrease in different areas, but in almost all areas will become more variable, with increased incidence of both droughts and floods. This will increase market instability and both production and price risks in input use. At the same time there will be global mitigation policies that may discourage and/or raise the price of inorganic fertiliser use (as a result of high fossil fuel energy intensity and hence high carbon foot print of the manufacture of nitrogen fertilisers, and possible CO₂ taxes or costs in reducing CO₂ emissions). Increased resilience and reduced vulnerability in the face of the indirect and direct threats of climate change can be achieved by greater natural, social, physical, human and financial capital and greater diversification of crops within farms and of farm and non-farm activities within local and national economies. Increased capital and diversification are intrinsic components of economic growth and development. The major implication of climate change for input subsidy programmes is therefore to increase the urgency and importance of such programmes' contributions to rapid broad based pro-poor growth through more effective design and implementation and through more effective integration with complementary policies and programmes in food markets and prices, in natural resource conservation soil fertility, and in wider non-farm diversification and development.

6. Conclusions

Countries considering the introduction of agricultural input subsidies can learn a number of points from the theory and experience summarized in this paper, recognising the different major benefits they can potentially yield, the conditions required for those benefits to be realized, and the possible very significant pitfalls from ineffective or inappropriate implementation. Key conclusions from theoretical and historical analysis are that:

- input subsidies have played an important role in successful agricultural development in the past, offering major potential gain when effectively applied to overcome market failures constraining growth in poor rural areas, but also carrying substantial risks of costly, ineffective and inappropriate design and implementation using large amounts of scarce government and national resources for little gain;
- they have greatest (but not exclusive) potential in contributing to wider growth when applied to the production of staple grains rather than to cash crops (as a result of both the greater contribution to overcoming producer constraints on input use in staple food production and the greater benefits to consumers from their stimulus to increased production of staples);
- a key contribution of input subsidies will commonly be their contribution to consumers' welfare and real incomes through lowering food prices, while also benefitting producers, but this requires very large scale implementation to bring

prices down (perhaps below import parity) with substantial costs and risks and a strong emphasis on wider pro-poor dynamic growth objectives and complementary investment and output market development policies;

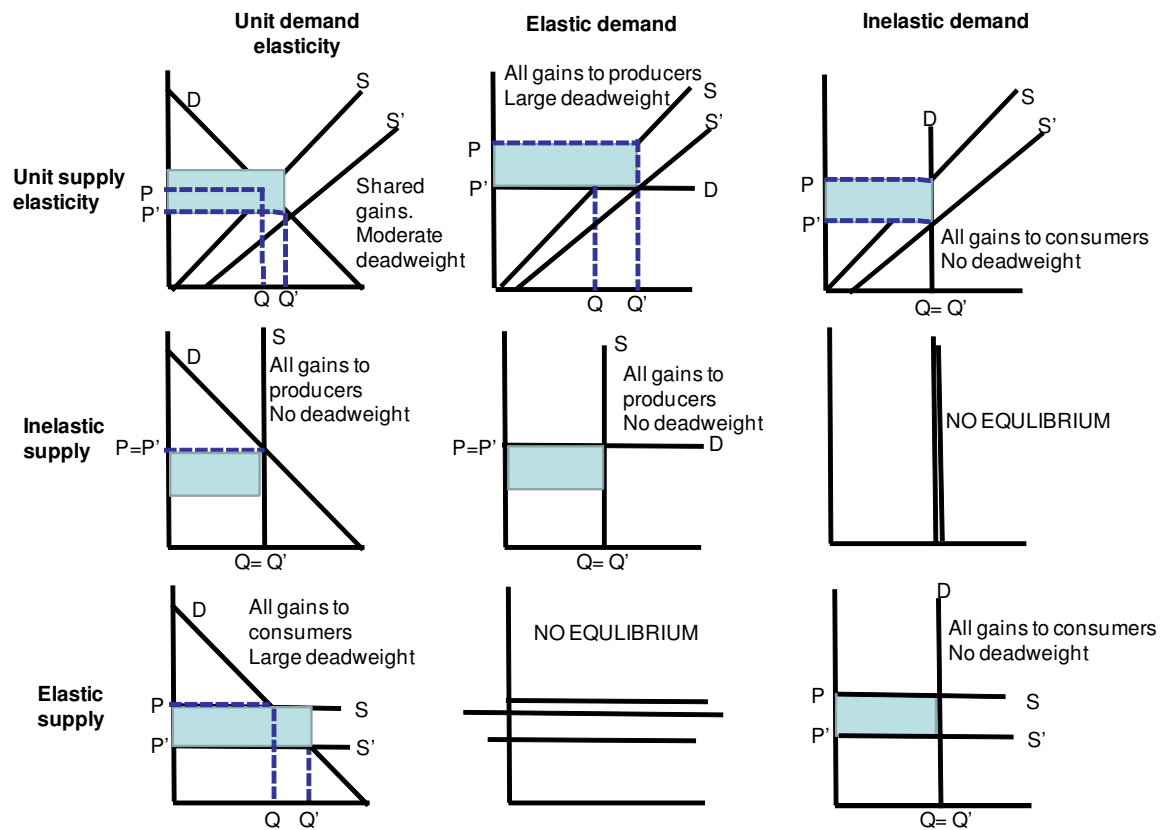
- the dynamic policy objectives of input subsidies are, like policy objectives in wider agricultural development, paradoxical – with investments in staple crop production and agriculture in order to stimulate diversification out of staple food and agricultural production;
- rationing and targeting are important features of effective subsidies – to limit costs and ensure that subsidies are largely delivered to producers whose effective input use is constrained by market failures – and smart subsidies use for rationing and targeting can substantially address conventional criticisms of subsidies;
- smart subsidies are nevertheless still subject to major political economy and implementation challenges and need further new thinking and theory, with ongoing action research seeking to constantly improve effectiveness and efficiency and to keep ahead of fraud and rent seeking.
- agricultural input subsidies are not a short term ‘quick fix’ –medium to long term investments in input subsidies are needed if they are to build up farmer knowledge and capital, supply systems and wider economic growth. However the risks of their diversion, capture and inefficiency also grow over time, and this poses major political and technical challenges.

A review of a limited number of current and recent input subsidy programmes in Africa shows that there is limited implementation of important aspects of smart subsidies, and weaknesses in design and implementation. There is also a lack of emphasis on improving programme effectiveness and efficiency and inadequate attention is paid to integration with complementary policies and programmes for improving achievement of both direct and indirect benefits of input subsidy programmes. There is also a mixed record as regards use of input subsidies to develop input supply systems. Some of these aspects of input subsidy programmes are associated with divergence between political economy and more technocratic interests. Nevertheless these programmes have the potential to yield very substantial short term economic and longer term growth returns.

Lack of information on subsidy programmes in Africa highlights a major need for country studies that report different countries’ recent experience with input subsidies, using the conceptual framework presented in this paper to allow a more comprehensive review and lesson learning than is currently possible.

Consideration of the considerable challenges and threats posed by global market and climate change and volatility emphasises the importance and urgency of (a) improving the efficiency and effectiveness of input subsidy programmes in contributing to increased agricultural productivity, food security, and wider non agricultural development and structural change, and (b) of looking for ways to reduce fertiliser use (through greater field efficiency in their application and through use of complementary soil fertility management practices) and to reduce supply costs.

Appendix 1: Effects of different output supply and demand elasticities on producer and consumer gains from input subsidies



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